

Cheque Deposition System Using Image Processing & TCP-IP Protocol

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ABSTRACT: Bank cheques are still widely used for financial transactions all over the world. Huge volumes of cheques are manually processed everyday. User written information such as date, amount, account number, payee name, cheque number and signature has to be visually verified. Nowadays, the banks have made a compulsion for the use of cheque truncating system (CTS) complaint cheques for saving much time and effort for deposition of cheques. An attempt is made in this paper to reduce the human efforts, time and money for automatic processing of cheques.

KEYWORDS: Cheques, Recognition, Electronic Cheque Clearing System, Cheque Truncating System, OCR.

I. INTRODUCTION

With the development in image processing it is now possible for machines to read from documents as in the case of humans. Use of image processing in cheque deposition can reduce the manual efforts, time and also become cost effective. Paper cheques are still used widely for non-cash transaction even after the implementation of credit/debit cards and other means of electronic transactions. In many countries including India, the cheque processing procedure requires a bank employee to read and enter the information on a cheque. As large number of cheques has to be processed every day, an automatic reading system can save much of the work. Even with the advent of successful character recognition algorithms it is still difficult to recognize handwritten information. So we use specially printed cheques for our system.

The manual cheque clearing process is as shown in fig 1. It is a time consuming process and also require a lot of human effort and time. These drawbacks can be overcome using automatic cheque deposition system and its clearing process is as shown in fig 2.

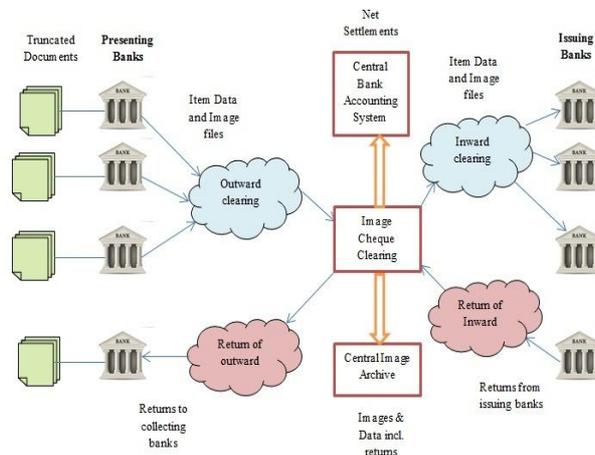


Fig 1:- Automatic cheque clearing process

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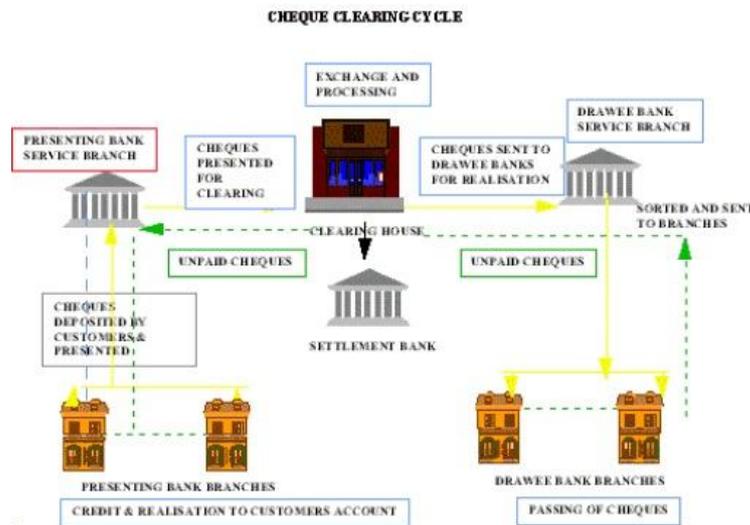


Fig 2:- Manual cheque clearing process

II. LITERATURE SURVEY

Automated cheque processing system has become the most important aspect in all banking sector. Since it involves less time for clearance and comparatively less paper work is required, this form has become a huge success.

A. TJSB Bank

All cheques and other negotiable instruments payable locally will be presented through the clearing system prevailing at the centre. Cheques deposited at Branch counters, Cheque collection machine and in collection boxes within the Branch premises before specified cut-off time will be presented for clearing on the same day. Cheques deposited after the cut-off time will be presented in the next clearing cycle. To fix the cut-off time limit for receipt of cheques will be decided by respective Branch Manager as per locations, based on local practices (Cut-off time will be display on the collection counter) The Bank will give credit to the respective customer account on the same day in which the clearing settlement takes place. Withdrawal of amounts so credited would be permitted as per the cheque return schedule of the respective clearing house. Bank branches situated at centers where no clearing house exists would be present local cheques on drawee banks across the counter and proceeds would be credited at the earliest, on realization [7].

B. ICICI Bank

All cheques and other negotiable instruments payable locally will be presented through the clearing system prevailing at the center. Cheques deposited at branch counters and in collection boxes within the branch premises before the specified cut-off time will be presented for clearing on the same day. Cheques deposited after the cut-off time and in collection boxes outside the branch premises including off-site Automated Teller Machines will be presented in the next clearing cycle. As a policy, the Bank will give credit to the customer account on the same day in which the clearing settlement takes place. Withdrawal of amounts so credited would be permitted as per the cheque return schedule of the clearing house. Bank branches situated at centers where no clearing house exists, would present local cheques on drawee banks across the counter and it would be the bank's end to credit the proceeds at the earliest. To enhance the efficiency of the paper based clearing system, the Cheque Truncation System (CTS) was implemented in the National Capital Region (NCR). Since July 2008, all the member banks of the New Delhi Bankers' Clearing House are participating in the CTS. To encourage complete migration of cheques in the NCR of Delhi to CTS, the processing charges in respect of cheques presented in CTS were waived till June 2009. With the complete migration of cheque clearing to CTS, the separate paper based clearing, has been discontinued from July 2009. CTS grid has been implemented at three locations; Delhi, Chennai and Mumbai. The clearing of various cities has been linked to the CTS



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(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2014

grid at these three locations. Reserve Bank of India will continue to issue directions to include clearing of additional cities to the three grid locations. Cheque return charges shall be levied only in cases where the customer is at fault and is responsible for such returns. Cheques that need to be re-presented without any recourse to the payee, will be made in the immediate next presentation clearing not later than 24 hours (excluding holidays) with due notification to the customers of such re-presentation through SMS alert [8].

C. HDFC Bank

All cheques and other negotiable instruments payable locally would be presented through the clearing system prevailing at the centres. Cheques deposited at branch counters and in collection boxes within the branch premises before the specified cut off time will be presented for clearing on the same day. The cut off timings varies from branch to branch. The applicable cut off timings is displayed on the cheque drop box and in branches for the benefit of customers. Cheques deposited after the cut off time and in collection boxes outside the branch premises including off site ATMs will be presented in the next clearing cycle. We would give credit to the customer account on the same day clearing settlement takes place. Withdrawal of amounts so created would be permitted as per the cheque return of the clearing house. Funds for cheques presented in normal clearing are available to the customer at the beginning of the second to fourth working day, subject to local clearing house arrangements. There however is a dependency on the clearing location and is subject to depositing of the cheques /instruments within the defined time [9].

D. Bangladesh Cheque Processing System

The basic feature of BACPS was adoption of new cheque design standard with a Magnetic Ink Character Recognition (MICR) code line and the exchange of cheque-image and data instead of paper cheques for clearing and settlement purpose. Banks were required to make arrangement and develop infrastructures to meet the requirements of the new system. Bangladesh Bank adopted necessary Regulations and issued Operating Rules and Procedures in this regard. The automated cheque clearing system is highly configurable, user-friendly and highly productive.

E. Bank of Thailand

In this automated cheque clearing system, they used the Electronic Cheque Clearing System (ECS) technology. This technology brought a lot of progress to their bank and also established high productivity. This system was operated by the electronic cheque clearing House (ECH) of the Bank of Thailand. The ECS had been developed and used in Bangkok and metropolitan areas. Members of the ECH would connect online with the ECS located at the Bank of Thailand's Electronic Clearing House (ECH). The cheque data would then be sent online to the ECS by the head quarter of the sending bank and the physical cheques will be sent to ECH by evening the same day for sorting and cross-checking with the cheque data received earlier. Hence with ECS, working hours for cheque depositing was no longer so that the customers could deposit cheques at any banks in Bangkok and metropolitan area. When a customer deposited a cheque at a bank, the sending bank would capture both the front and the back of the cheque into cheque images as well as prepare the data related to the cheque in order to send them online to the Bank of Thailand's Electronic Clearing House (ECH). The ECH will then sort the cheque images and data before sending them to the appropriate paying bank for verifications and approval of payment. If payment for the cheque is refused, the paying bank would inform the ECH online of the return status of the cheque, the ECH would then inform the sending bank accordingly. The sending bank will then return the physical cheque attached with cheque return advice to the customer [4].

III. PROPOSED SYSTEM

The proposed system is a mobile application through which we automate the process of depositing a bank cheque by sending the image of the cheque. It provides a mechanism for recognizing the cheque fields using Object Character Recognition. Various approaches are possible for character recognition with a lot of scope of research. We use various image processing techniques to extract the parameters of cheque and verify the character based on these parameters by comparing it to the samples stored in the database [Fig 4] [1]. The smartcard will be given to the bank customer. Whenever he wishes to deposit a cheque; first, he should place his cheque on appropriate position. Once cheque is placed properly; the payee should use his smartcard and enter the password to access his account. If fails to authenticate then whole process should be repeated. After successful authentication; an image of cheque will be taken by webcam and the data on the cheque image will be extracted by internal software. The extracted data will be sent to remote server accordingly with the help of Ethernet and TCP/IP protocol. In order to produce a successful automated cheque

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(An ISO 3297: 2007 Certified Organization)

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processing system, many problems have to be solved such as background and noise removal, recognition of the immense styles of handwriting and touching and overlapping data in various fields of information and errors in the recognition techniques.

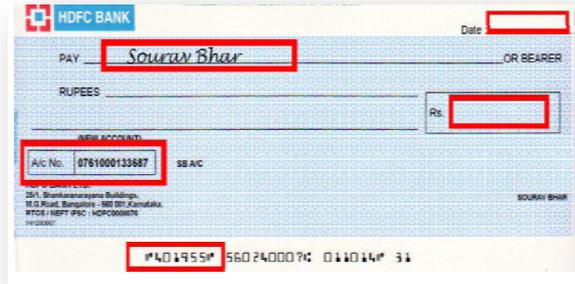


Fig 3:- Image of a cheque with the cheque field highlighted.

In the proposed system we will consider the following fields for cheque processing system as highlighted in Fig. 3:

- 1) Courtesy amount.
- 2) Account no.
- 3) Date.
- 4) Cheque No.

Image enhancement techniques are used to improve the quality of the image being captured. Cheque needs to be pre-processed before using it for the verification process. The date field, account number and the cheque amount is recognized using object character recognition method. The uniqueness of the approach lies in the fact that it doesn't necessitate any prior information and requires minimum human intervention.



Fig 4:- Database of characters

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 3, March 2014

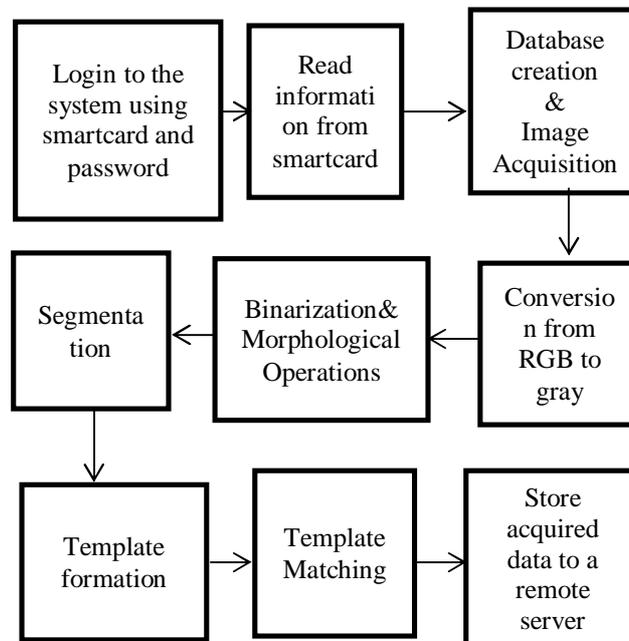


Fig.5:- Design of Cheque Deposition System

1. Logging on the system:

First log-on to the system using the smartcard and the password provided to the user.

2. Reading the smartcard:

After successful authentication of the smartcard the information is read from the card.

3. Image Acquisition:

The image is acquired only after successful authentication a signal will be sent to the system to acquire the image by the controller.

4. Database Formation:

First the database for training set is created. For this we should create database of 0 to 9 numbers and A to Z characters to recognize numbers and name on cheque. Database of various fonts should be used for increasing accuracy.

5. Recognize Account Number and Cheque Amount:

The account number is recognized by the Optical character Recognition (OCR) method[10]. This process helps to identify the sender and the amount is debited from the senders account and credited to the receivers account.

6. Recognize the cheque number and date field:

This is done to ensure that the cheque amount is credited only once and that the image of the cheque is not used more than once. The account number, cheque amount and date fields are recognized using Optical Character Recognition (OCR)[10]. The process of Date field recognition helps to maintain the record of transactions carried out by every user.

7. Processing the Transaction for Valid User:

On positive verification of the smartcard the extracted data is transferred to a remote server using Ethernet.

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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Vol. 3, Issue 3, March 2014

IV. BLOCK DIAGRAM

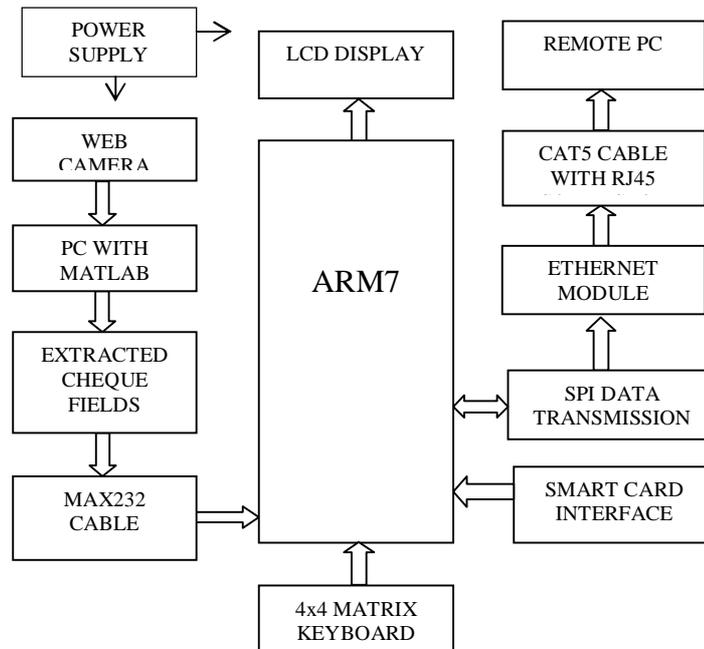


Fig 6:- Block Diagram of the system

The person who wants to deposit the cheque has to have an ATM card. He then swaps the ATM card. In the project we will design a smart card which will have its own memory. In this memory the information of the depositor will be stored. After swapping the card he will be asked to enter the pin number. After the pin number is verified the controller will order the web cam to capture the image of the cheque. Also the controller will retrieve the data from the card. This image is then processed in the MATLAB software program where the cheque number extraction is done.

The cheque number extraction is done by optical character recognition technique. OCR (Optical Character Recognition) also called Optical Character Reader is a system that provides a full alphanumeric recognition of printed or handwritten characters at electronic speed by simply scanning the form. So by OCR we get the cheque number. The cheque number is then sending to the controller. A MAX 232 cable is used for this purpose. A MAX 232 cable sends the data serially to the controller. The controller used in this case is ARM7. On the controller side LCD display is used to make the transaction process user friendly. The depositor can enter the PIN and also can check for the transaction on the LCD. A 4x4 matrix keyboard is used to enter data. The keyboard and the LCD display will be interface to the controller.

We will then find the time and date at that particular instant by using a real time clock. Thus the controller will collect all the required information of the transaction and saves bit in the memory. The information will have the cheque number, the image of the cheque, time and date of the transaction and the information of the depositor who is depositing the cheque. On collecting all these information the controller will send the data to the Ethernet module ENC28J60. This module is an Ethernet controller which converts the data in pc compatible form. It will use the TCP/IP protocol to send the data to the remote PC. The TCP/IP stack is implemented in the controller. After the process the data is then send to the PC through CAT5 cable having a RJ45 connector. A program is developed in Visual Basics will saved the data received through the cable. Thus the transaction will take place. A user can verify the transaction by using his details.

Following is the figure showing the sample cheque and the MATLAB Graphic User Interface (GUI) with the output.

The output shows the extracted data from various data field.



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Vol. 3, Issue 3, March 2014

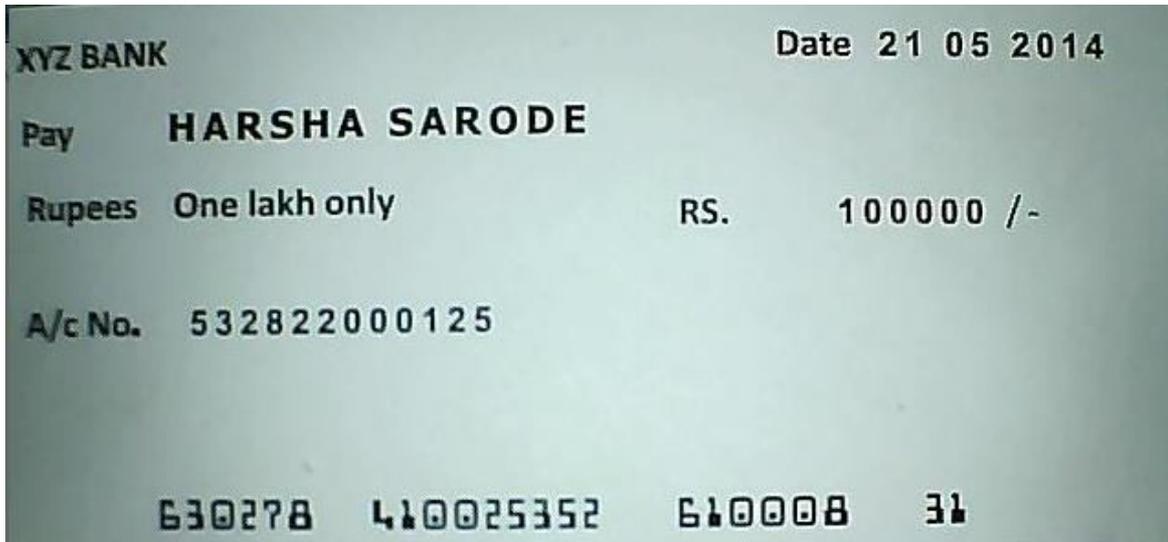


Fig 7:- Sample Cheque (Printed)

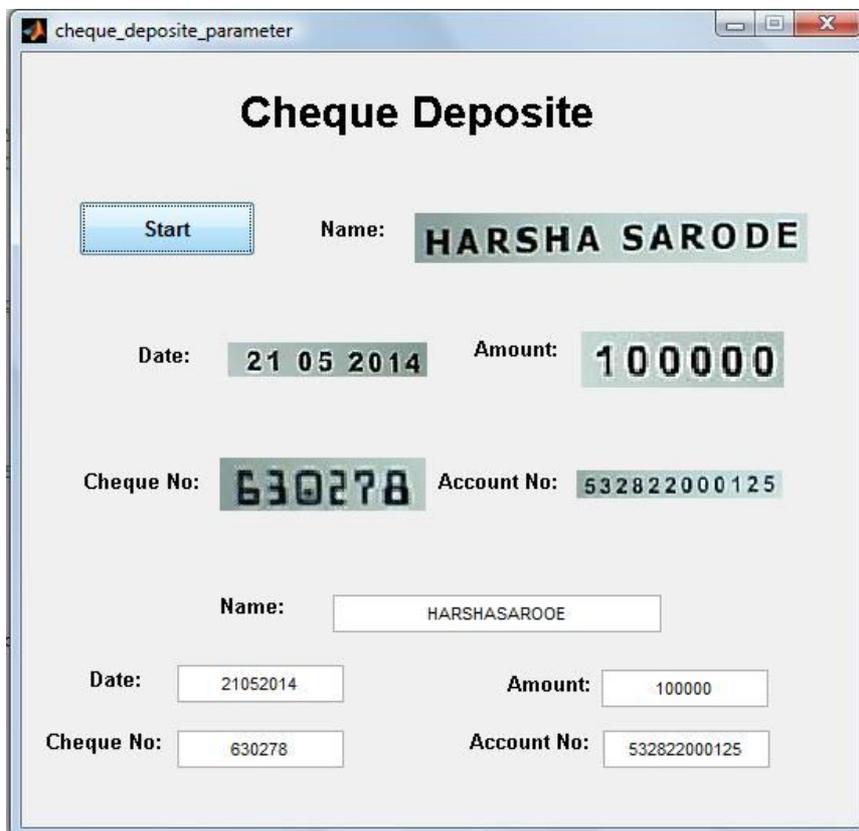


Fig 8:- MATLAB GUI with output



International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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Vol. 3, Issue 3, March 2014

V. RESULT

The system was tested for various printed cheques and found to be 100% accurate under maintained conditions. Handwritten characters can be recognized with up to 80% accuracy under maintained conditions.

VI. CONCLUSION

We have proposed a system with the main emphasis on reducing the manual efforts required to deposit a cheque and to make the process of banking smoother than the existing one. Even if misclassification occurs, the mistake could potentially be detected during the recognition process; however it is more desirable that the system rejects a cheque in case of doubt so that it can be directed to manual processing from the beginning.

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BIOGRAPHY



Hrishikesh Samant was born in Maharashtra in 1991. He is currently pursuing his Bachelors of Engineering from Nutan Maharashtra Institute of Engineering & Technology affiliated to University of Pune, Maharashtra, India. His current research interests include Digital Image Processing & Networking.



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