

Automating Data Entry Forms for Banks Using OCR and CNN

Maithilee Vaidya, Praveen Kumar Rule, Hitesh Kumar, Akansha Jain, Prof. Asmita R. Kamble

Department of Computer Engineering, Sinhgad Institute of Technology and Science, Narhe, Pune, Maharashtra, India

ABSTRACT

Digitalization of money transfer is a must in the present situation of banking operations. Clients have a variety of ways to carry out transactions, such as credit, wiring money, and so forth. However, depositing cash requires the physical presence of the depositor at the bank, and cashier needs to enroll the transaction into the system, which slows down the rate of money deposit and teller's activity. To accelerate the process, banks around the world have to adapt and construct guidelines for a digital deposit. To accurately digitize and transmit deposit slip information from smartphones to the bank, a scheme called "Automating Data Entry Forms for Banks Using OCR and CNN". The deposit slip scanner algorithm is based on input from the Smartphone camera.

Keywords : OCR engines, Preprocessing, Row and character segmentation, Otsu's thresholding Techniques

I. INTRODUCTION

Optical Character Recognition (OCR) finds an important application in building intelligent indexing systems in today's computer world. Character recognition is the learning of how machines can monitor the environment, learn to distinguish characters of interest from their background, and make sound and reasonable decisions about the categories of the character.

Character recognition is becoming more important under the influence of HCI. Handwritten character recognition is a part of pattern recognition is again challenging and demanding application in recent years which is widely used in public security, taxation, transportation, finance, education and other industries in the practical activities.

OCR is classified into two main domains: off-line recognition which deals with images of characters that are previously written and online recognition in

which the writer writes directly to the system, the online problem is usually easier since more information is available. The Offline Character Recognition using Back Propagation Neural Network is explained below. At the point when a text document is checked into the PC, it is changed into a bitmap, which is an image of the document. OCR software evaluates the light and dark areas of the bitmap so as to identify each alphabetic letter and numeric digit. Handwriting is much more difficult to analyze than machine-printed characters.

OCR usually involves three processes, namely text localization, character segmentation, and recognition. Character segmentation is a significant step for OCR due to its efficiency depends on proper character segmentation results. The segmentation is responsible for correctly recognize the character and also for the segmentation. There are some OCR techniques used but they have many issues arises because of different writing styles and font sizes. Sometimes several touched typescripts create problems throughout

segmentation and consequently recognition error takes place. Also, the intermixed texts in a multilingual environment, it still remains a challenging problem.

II. LITERATURE REVIEW

The survey is carried out on different techniques used by the researcher are as follows:

Rana S et al. [1] focus on to recognize the Arabic handwritten character using a neural network. The proposed system uses the Hopfield Algorithm which designed using MAT-LAB. The system has 3 main stages i.e. preprocessing, feature extraction and then recognition.

Ali Farhat et al. [2] uses the OCR technique for recognizing a Qatari number plate.. The proposed system implemented in MATLAB. Also, the used 4 types of algorithms for feature extraction and template matching like vector crossing, zoning, zoning, and vector crossing, template matching-correlation. These algorithms are developed to generate an encoded text from the segmented characters from Qatari NP images.

S. Rishi Kumar et al. [3] proposed system combines the concept of Optical Character Recognition (OCR), text to Speech Synthesizer (TTS) and translator in Raspberry Pi.

The hardware device consists of two modules, the image processing module, and the voice output module.

Baoguang Shi et al. [4] investigate the problem of scene text recognition, which is among the most important and challenging tasks in image-based sequence recognition.

The system proposes a neural network architecture, which integrates feature extraction, sequence modeling, and transcription into a unified framework. Parul Sahare et al.[5] proposed system introduces the algorithm for character segmentation and recognition is presented for multilingual Indian document images of Latin and Devanagari scripts. The proposed system uses the SVM and k-NN classification algorithms. The SVM used for the character segmentation and k-NN used for character recognition. Also, in the character recognition algorithm, three new geometrical base shaped features are computed.

Sebastian Stoliski et al [6] nowadays, a lot of paper documents are transformed into electronic form, which eases information processing, like searching, analysis, and conversion. The analysis of OCR usability for automatic data entering is explained. The study is based on realistic experiments, tests, and productive utilization of the OCR systems. The experimentation was performed on two available data types: bar-codes and filled text forms. With the help of this system, various types of documents were tested: bank transfer forms, insurance forms, invoices, banking contract, and application forms.

X. Zhai et al. [7] proposed an OCR algorithm for automatic umber plate recognition system. The algorithm uses a multi-layer feed-forward neural network. A parallel and pipelined architecture based on the algorithm is also proposed. Implemented on am FPGA chip, this paper claims to improve energy efficiency and reduces the overall cost.

In [8], two methods were used to execute OCR. Initially, template matching techniques are used, where it correlates the image of the unknown character with a given set of templates to recognize the character. Secondly, support vector machine (SVM) classifiers are used to train the data by using feature extraction techniques to identify the input character.

III. PROPOSED SYSTEM

Nowadays the whole world is shifting in the digital world. They want everything in digital form, they are not ready for manual work or any manual handwritten transaction. Also, they want to avoid the handwritten data.

Depositing cash requires the physical presence of the depositor at the bank, and cashier needs to enroll the transaction into the system, which slows down the rate of money deposit and teller's activity. To overcome such issue we are proposing an OCR based effective system which transmits deposit slip information from smartphones to the bank. With the help of CNN, we can recognize the data from the slip.

A. System Architecture

OCR engines transform pictures of machine-printed characters into machine-coherent characters. It can be used in many applications. Here we are developing a system which can be used in banking for automating the data entry forms. Fig. 1 shows the architecture of the proposed system.

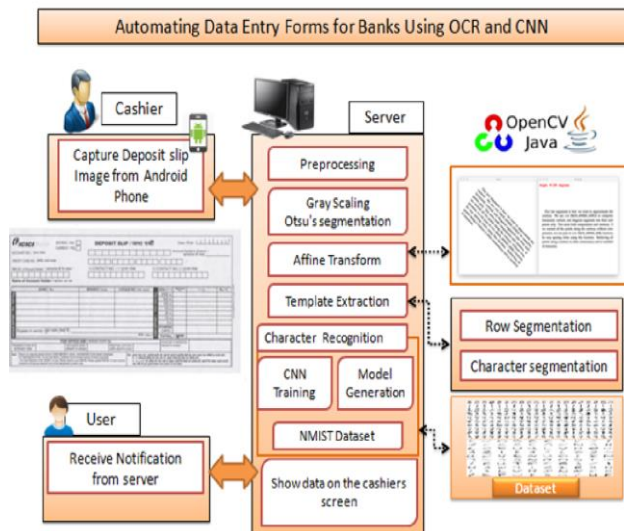


Fig. 1 System Architecture

B. The Flow of the proposed system is shown below:

1) Capture Image:

The camera captures the deposit slip from cashier's android phone.

2) Apply Gray scaling on Image:

Without preprocessing we can't get 100% accuracy, so we have to do preprocess on images and then send for further process of recognition. Preprocessing involves converting the frame into another format (gray scale, binaries image and so on).

3) Apply Otsu's Thresholding Techniques:

Noise represents unwanted information which deteriorates image quality. Noise can be added to the images at the time of capturing. Before applying image processing tools to an image, noise elimination from images is done at maximum priority. We are going to use Otsu's algorithm to perform thresholding on the gray scale image.

4) Apply affine transform:

The Affine Transformation is a general rotation, shear, scale, and translation distortion, operator [9]. That is it will change an image to carry out all four of the given distortions all at the same time. We use affine transform to straighten the tilted image at the time of image capturing.



Fig. 2 Affine Transform

5) Row Segmentation: Character height wise row segmentation will do in row segmentation stage. In which we can extract the meaningful information from the deposit slip. Such as -

- a) Account Number
- b) Pan Number
- c) Amount to deposit
- d) Signature

6) Character Segmentation:

Segment characters from an image like "AAAA1234ABC" are the no of pan card we have to detect using image processing then we have to capture image and segment all character from the given image and then send input to CNN for Number Recognition. In this step we are doing one by one character segmentation and create segmented character images.

7) CNN for Number recognition

a) Number Recognition: 0-9 number recognition in this stage.



Fig. 3 Numerical Dataset

This kind of dataset will used for recognize number from segmented images.

b) Character Recognition



Fig. 4 Character Dataset

This kind of dataset will used for recognize character segmented from images.

8) CNN Training on Predefined Highlights Dataset Download the MNIST database of handwritten digits.

Four files are available on this site:

- train-images-idx3-ubyte.gz: training set images (9912422 bytes)
- train-labels-idx1-ubyte.gz: training set labels (28881 bytes)
- t10k-images-idx3-ubyte.gz: test set images (1648877 bytes)
- t10k-labels-idx1-ubyte.gz: test set labels (4542 bytes)

1. Training set of 60,000 examples
2. Test set of 10,000 examples

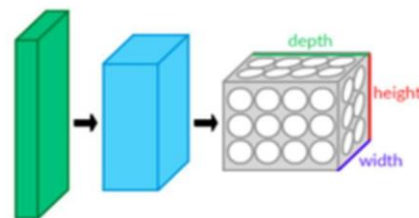


Fig. 5 – CNN

A CNN consists of an input and an output layer, in addition to many hidden layers. The hidden layers of a CNN usually consist of Convolutional layers, pooling layers, fully connected layers and normalization layers. CNN will be used to train the images analytics engine for recognizing important data from images.

9) Show Recognized Data On Cashiers Screen Recognize Account number, Pan Number, Deposit amount, signature from deposit slip will be displayed on the cashiers screen for further action.

IV. MATHEMATICAL MODEL

Let us consider S be a Systems such that

$S = \{U, C, V, I, T, F, FT, Ds, Ss\}$, where

- $U = \{U1, U2, U3, \dots, Un \mid U \text{ is a Set of all USERS } \}$
U is the users of the system. Users of the system may grow as the system is used by more and more people. User is infinite set.
- $C = \{C \mid C \text{ is the camera } \}$ C is the cameras Camera capture the deposit slip from cashiers android phone. There will be finite set of cameras connected to system.
- $T = \{T1, T2, T3 \mid T \text{ is the technique used to process Input image } \}$ T is the technique used for image processing. This is a finite set.
- $I = \{I1, I2, I3, \dots, In \mid I \text{ are the input images } \}$ I are the images used in the system. This is infinite set.
- $Ds = \{ \text{USER INFO, TRAIN DATA} \mid DS \text{ is a Set of data table for permanent storing of data on server } \}$
- $Ss = \{ S \text{ images, S feature} \mid Ss \text{ is a Set of Storage Service} \}$ STORAGE SERVER will provide services for storing Login, Registration details. As this set also has finite attributes, so this is also Finite Set.
- $Ac = \{ A \mid A \text{ are the Affine Transform Technique } \}$
- $G = \{ G1, G2 \mid G \text{ is the segmentation technique by the system } \}$
- EVENT 1
User will make registration on Encryption Server & Storage Server. Let $f(U)$ be a function of User
Thus, $f(U) \rightarrow \{ U Ds \}$
- EVENT 2
Let $f(C)$ be a capture function of System. Thus, $f(C) \rightarrow \{I1, I2, I3, \dots, In\} \in C$.
- EVENT 3

Pre Processing is performed on detected images. Let $f(P)$ be a image processing function. Thus, $f(P) \rightarrow \{I1, I2, I3, \dots, In\} \in T$.

- EVENT 4
Affine Transform technique to modify an image to perform distortions all at the same time. Thus, $f(S) \rightarrow \{I1, I2, \dots, In\} \in AC$
- EVENT 5
User can extract the meaning full information from the deposit slip. Let $f(U)$ be a function of user. Thus, $f(U) \rightarrow \{F1, F2, F3\} \in D$
- EVENT 6
Apply CNN on the features extracted to Recognize Account number, Pan Number, Deposit amount, signature from deposit slip Let $f(S)$ be a function of user. Thus, $f(S) \rightarrow \{ D \}$

V. SOFTWARE TESTING

ID	TEST STEPS			TEST STATUS (PASS/ FAIL)
	STEP	EXPECTED OUTPUT	ACTUAL OUTPUT	
1	Place deposit slip below camera	Acquires the photo	Acquires the photo	Pass
2	Apply gray scaling and perform thresholding on the image	Retrieves an image of lesser size and with less noise	Retrieves an image of lesser size and having less noise	Pass
3	Apply affine transform on image	Straightens the image if tilted	Straightens the tilted image	Pass
4	Extraction of meaningful information	Segment all the characters from given image	Segments all the characters from given image	Pass
5	Apply CNN on segmented image	Recognize number and character	Recognizes the number and	Pass

			characters from the deposit slip	
--	--	--	----------------------------------	--

Table 1 – Software testing

VI. CONCLUSION

We have developed a system which can provide automating Data Entry Forms for Banks.

With the help of OCR technique, we can recognize and analyze text from deposit slip image. The cashier can use the provided camera to perform this operation.

The system can be used to accurately digitize and transmit deposit slip information to the bank with the help of CNN which is used to recognize the Characters and Numbers.

Recognition can be done to get the Account number, Pan Number, Deposit amount, and signature from deposit slip. It will be displayed on the cashiers screen for further action.

VII. REFERENCES

[1] Rana S. Hussien, Azza A. Elkhidir and Mohamed G. Elnourani, Optical Character Recognition of Arabic Handwritten Characters using Neural Network, International Conference on Computing, Control, Networking, Electronics and Embedded Systems Engineering, 2015

[2] Ali Farhat, Ali Al-Zawqari, Abdulhadi Al-Qahtani, Omar Hommos, Faycal Bensaali, Abbes Amira, OCR Based Feature Extraction and Template Matching Algorithms for Qatari Number Plate, IEEE, 2016.

[3] S. Rishi Kumar, G.Madhavan, M. Naveen, S.Subash, U. Selvamalar Beulah Ponrani, Image Processing based Multilingual Translator for Travellers using Raspberry pi, International Journal of Advanced Research in Computer and Communication Engineering, 2017.

[4] Baoguang Shi, Xiang Bai, Cong Yao, An End-to-End Trainable Neural Network for Image-Based Sequence Recognition and Its Application to Scene Text Recognition, IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 39, NO. 11, NOVEMBER 2017.

[5] Parul Sahare, Sanjay B. Dhok, Multilingual Character Segmentation and Recognition Schemes for Indian Document Images, IEEE Access, 2017.

[6] SebastianStoliski, WojciechBieniecki Application of OCR systems to processing and digitization of paper documents.

[7] X. Zhai, F. Bensaali and R. Sotudeh, 'Real-time optical character recognition on field programmable gate array for automatic number plate recognition system', IET Circuits, Devices & Systems, vol. 7, no. 6, pp. 337-344, 2013.

[8] X. Yafang, 'Optical Character Recognition', Available: [http://web.eecs.umich.edu/irasole/teaching/451/2014fall/gradprojects/optical character recognition final report.pdf](http://web.eecs.umich.edu/irasole/teaching/451/2014fall/gradprojects/optical%20character%20recognition%20final%20report.pdf).

[9] Affine Transform - <http://www.imagemagick.org/Usage/distorts/affine/>

Cite this article as :

Maithilee Vaidya, Praveen Kumar Rule, Hitesh Kumar, Akansha Jain, Prof. Asmita R. Kamble, "Automating Data Entry Forms for Banks Using OCR and CNN", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 5 Issue 3, pp. 326-331, May-June 2019. Available at doi : <https://doi.org/10.32628/CSEIT195387>
Journal URL : <http://ijsrcseit.com/CSEIT195387>