Automatic Check Processing System

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Abstract*—Automatic Cheque Processing, it is one of the most studied areas of the 0alysis of documents and biometric data. In this area, several methods are proposed for the Automatic Cheque Processing and forgery detection. Sometimes an account holder gives self-cheques to another person. Some persons provided a self-cheque to him/her by counterfeiting signature of another person. Due to the us can observe significant rise in forgery cases. In this paper, we propose a mechanism for the recognition of the fields of the cheque, such as first name, last name, and the amount, as well as how to verify the signature, and the authenticity of it. We propose a unique two-stage model of automatic cheque processing with the detection of skilled forgery of the signature by pre-processing of the image of the cheque, segmentation, and feature extraction. It was found that the nature of the risk, the precision and accuracy of 95%, the character recognition (OCR) is the efficiency of 83%, the number of recognition efficiency of 91% or more, and the system will detect the forgery, with an accuracy of 80% to detect signature, with an accuracy of 91%.

***Index Terms*- Forgery detection, authenticity, segmentation, ACS, feature extraction, efficiency, accuracy.**

I. INTRODUCTION

The widespread use of bank accounts, in everyday life, enabling the development of check-in systems for the handling of urgent need for banks and other financial institutions. Of banking operations, checks are still growing, world-wide, in spite of the global rapid rise in the popularity of electronic payments with credit or debit cards. However, fraud control, will be charged the same rate, but with a regular loss. Therefore, an automatic bank account management system is essential, not only to the fight against the rise of the ' fraud on the part of the checking in our day to day lives, as well as to improve the productivity and improved customer service. Straight-through processing of a bank draft is to extract and recognize the manlicript, or in the customer-entered information from a variety of data fields that appear on the monitor, such as the courtesy amount, the amount, the date, the payee, as well as the signature.

Figure 1: Different fields in a bank Cheque

One of the most important obligations in automated bank cheque processing is the extraction of handwritten signatures from financial institution cheques and then feeding them to an off-line signature verification gadget which checks the signature for authenticity. The extraction and recognition of handwritten data from a financial institution cheque pose a powerful challenge which includes several subtasks such as extraction and recognition of signatures, courtesy amount, legal amount; payee and date using PCA and OCR strategies. *The* character of financial institution cheques is various and complex and this makes the problem of automatic bank cheque processing very difficult. The best manner to extract signatures from financial institution cheques and other forms is to have a few type of prior data

II. LITERATURE SURVEY

Image processing is a wide area research field; the literature survey has been carried out to perceive the problem specific field.

1. Snehal K.Jadhav, M.K.Chavan, "Symbolic Representation Model for Off-line Signature Verification"

Nowadays, in our daily existences° the importance of handwritten signatures is growing, due to the fact that human beings are more secure with pen and papers for all of the felony transactions. So it is very necessary to verify the identification of a person based on his handwritten signature. Identifying the human identity is more difficult work. So to triumph over this problem offline signature verification technique is proposed primarily based on symbolic representation version. Author—structured technique is used to generate symbolic illustration version. The system verifies the signature of two magnificence i.e. Actual signature and skilled forgery. Within the proposed work, Local Binary Pattern (LBP) features are used for feature extraction and symbolic features are then extracted for each function in every signature magnificence. As a result, the number of symbolic features is received for each rne-i or woman's handwritten signature magnificence. The k-nearest neighbour set of rules is used to classify the real signature and skilled forgeries.

2. Vamsi Krishna Madasu, Mohd. Hafizuddin Mohd. Yusof, M. Hanmandhill, Kurt, "Automatic Extraction of Signatures from Bank Cheques and other Documents"

An innovative approach for extracting signatures from bank cheque images and other documents is proposed based on the integration of the crop method with the sliding window technique. The idea is to estimate the approximate area in which the signature lies using the sliding window technique. In this approach, a window of adaptable height and width is moved over the image; one pixel at a time and the density of pixels within the window is calculated. This density is then used to find the entropy, which in turn helps fit the box that can segment the signature. The signatures thus extracted are then fed to a known fuzzy based offline signature verification and forgery detection system. The proposed method has been applied with almost 100% success on several bank cheques from India, Malaysia and Australia. Signature extraction has also been shown on two typical types of documents which have varied and noisy backgrounds.

A. PROBLEM STATEMENT

To overcome the problem of forgery using the automatic cheque processing,

1) Input: Scanned Image (jpg, jpeg).
2) Process:
a) Image pre-processing: Conversion of grey scale image to binary image.
b) Pigmentation and Extraction: Technique to find the required region.
c) Once characters are segmented, they are saved as separate image in corresponding directory.
3) Output: Verified signature.

B. OBJECTIVES

1) To overcome the problem of forgery.
2) To propose an improved algorithm for automatic cheque processing.
3) Identify the cheque to verify the signature to precede further process.
4) To compare the performance of the algorithm.

III. PROPOSED METHODOLOGY

The system design emphasizes the design of the system architecture that describes the structure, behaviour and more views of that system and analysis. The Figure 2 depicts the data flow diagram of the automatic cheque processing using the image processing techniques.

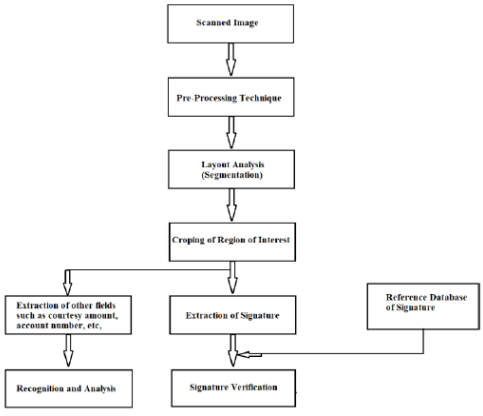


Figure 2: Proposed system for ACS

A. INPUT IMAGE

The image of the bank cheque is captured, scanned and stored for further processing. This image stored can be used for deriving the region of interest on the cheque for extraction of crucial details.

B. PRE PROCESSING

Cheque needs to be pre-processed earlier than the usage of it for the verification manner.

1) Noise removal

A simple 3x3 kernel median filtering is applied followed by way of morphological smoothingd clean the spatial noise characterised through small components. It'll do away with the image abnormalities such as scanning error and ink variations. Resizing the area normalizes the filtered snap shots. We've not carried out rotation invariance. We've taken into consideration that the image follows an identical sample. In some of the works the signatures are turned aroup to a single monotonous plane. This could now not be pretty an appropriate method because every person signs at a unique slant. Therefore slants also are vital keeping features.

2) Binarization

All grey dale images are converted into binary picture. On this method imply grey scale values of the pictures are extracted and values greater than the mean are mapped to white whereas the values lesser than which can be marked as black.

C. SEGMENTATION

For cheque segmentation technique we have conblered region based segmentation. The scanned cheque is first resized to 540x540 sizes. Now the fields are segmented by feeding the crop points. This is done by first applying manual segmentation of the field, then averaging the points. The algorithm is as follows,

Step 1: First manually segment the payee, signature and courtesy amount field by using imcrop.
Step 2: Extract the area for each part.
Step 3: Repeat step 1, five times.
Step 4: Get the average starting and ending point for the area.
Step 5: Select the average points as the seed points.
Step 6: Automatically segment the cheque based on the values as determined by step 4.

Once the fields are segmented, they are fed to character segmentation system. Handwritten character segmentation system of ours works with sum graph approach. Here we first covert the character image to binary image. They we apply 3x3 kernel median filtering, followed by morphological smoothing. Then we convert the image into negative image. It gives white characters on a black background. The sum graph of the image is taken.

The image is segmented based on the occurrence of minima in the graph. Once characters are segmented, they are saved as separate image in corresponding directory. Character segmentation is performed only for courtesy digit and payee field and is not applied for the signature field.

D. CROP METHOD

The crop method is applied on the defined approximation area in a cheque. Its objective is to locate a rectangular box around an object of interest and remove other objects outside this area. If the signature is the object of interest in the cheque, this could be easily done. The crop method works by moving four vectors from four different directions (namely up, right, bottom and left) towards the object of interest. This procedure is illustrated as below:

For each vector, it will stop moving when it finds a point (black pixel) in its direction. Each vector will mark the border of each side of the rectangular box (i.e. Vector top marks the top border of the rectangle, vector right marks the right border, vector bottom marks the bottom border and vector left marks the left border.)

The complete cheque is not required for this step. Only the signature part is required for the processing. The signature region is cropped and this can be done automatically using MATLAB.

E. EXTRACTION

- OCR for Account Number, Cheque Number and IFSC Code

The account number present on the bank cheque is cropped to get a region of interest. Then use Optical Charter Recognition (OCR) to extract the numbers digit by digit in account number. Similar process is followed for Cheque Number which can be located at the bottom left of the cheque present in magnetic format. The extracted information is then stored in the database for further processing. For determining the Bank Name,

1FSC code present on the cheque is derived by the OCR technique and later string manipulation methods are performed to get the bank name denoted by its initials.

- Handwritten Text extraction from Cheque

Handwritten extraction of texts has been a challenging problem in Natural Language Processing. The handwritten texts can be recognized by making use of various Image Processing algorithms. Signature feature extraction and verification In the proposed system, features from signature are extracted and then compared with features which are stored to verify whether the signature belongs to the concerned person. The system is used to avoid the counterfeit incidents taking place in the banking institutions. Features are extracted using the PCA method. The extracted features are then matched with those stored in the database. If the signature is verified then the further execution proceeds else execution stops.

F. RECOGNITION AND ANALYSIS

Features are to be derived from the binary image. The features which are extracted are encrypted to store in the database. Subsequently whenever a new signature is fed as an input to the system, feature extraction takes place and verified with those stored features in the database. PCA method is used for the feature extraction method.

G. SIGNATURE VERIFICATION:

The extracted signature is further compared with the reference signatures stored in the database. The signature comparison is carried out. The colours of pixels that have the same coordinates within the signatures are considered and the colours of both the images are compared. If the colour of each pixel of bijii images coincides, the system considers the two signature images to be identical. Thus the signature verification is complete. If the pixels of the signature image and the reference signature are not matched, then verification fails.

IV. RESULT AND DISSCUSSION

IMPLEMENTATION REQUIREMENTS

In our project, we need some pre-requisites for implementing our code. They are,

- Operating system: Windows 10
- Software Tool: MATLAB
- Coding Language: Embedded C

- Datasets: In our project we are mainly concerned about Enke, Kannada and Thumb signature. For our project we have collected one example for each type of signature. Figure 3, Figure 4 and Figure 5 are the sample images of English, Kannada and Thumb signatures respectively, which we are considering as our datasets to compare signatures. The input scanned image of cheques which a customer gives for transactions are compared with the datasets to verify signature.
- Images of sampled cheques in datasets:

Figure 3: Sample image of English signature in Datasets

Figure 4: Sample image of Kannada signature in Datasets

Figure 5: Sample image of Thumb signature in Datasets

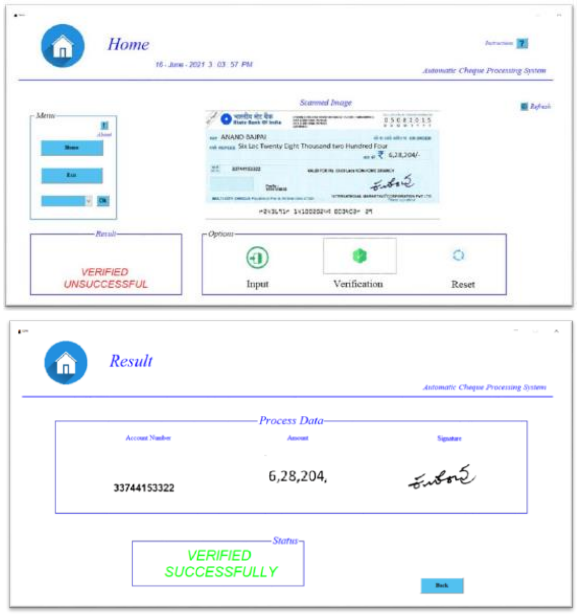
VERIFICATION OF CHEQUES Verifying of English Signature

The Snapshot 1 shows the verification of the English signature, in which enables the user to verify the signature. This given input provides the information

about the signature that it is verified successful or unsuccessful and also provides the information of result which contains account number, signature and amount when it is successful.

Snapshot 1: Verifying of English Signature

Verifying of Kannada Signature the Snapshot 2 shows the verification of the Kannada signature, in which enables the user to verify the signature. This given input provides the information about the signature that it is verified successful or unsuccessful and also provides the information of result which contains account number, signature and amount when it is successful.



Snapshot 2: Verifying of Kannada Signature

Verifying of Thumb Signature the Snapshot 3 shows the verification of the thumb signature, in which enables the user to verify the signature. This given input provides the information about the signature that it is verified successful or unsuccessful and also provides the information of result which contains account number, signature and amount when it is successful.

Snapshot 3: Verifying of Thumb Signature

PERFORMANCE METRICS:

- Multiple Cost Savings: Automating cheque processing guarantees minimized human involvement, in turn significantly lowering overall processing costs. Moreover, with micro tasking, even exception handling, where human data validation might be necessary, can be securely outsourced or crowdsourced to any part of the world, reducing processing costs even further.
- Improved confidentiality: This approach guarantees that users involved in data validation or quality control have no access to the original data and work only with small pieces of anonymous data which contain no personally identifiable information (PH). This way the original cheque images containing the confidential information never leave the customer site during the processing.
- Tuned for speed: The automated cheque processing is perfectly suited for large scale cheque processing projects. Not only does it take less than 1 second to read an entire cheque, but the solution itself is highly scalable.
- Easy integration: The solution can easily be integrated with popular ECM systems and databases using built-in, ready-to-use system connectors. This means, it can be deployed in any heterogeneous IT environment while the results of the processing can be directly exported into the necessary enterprise system or database.

V. FUTURE SCOPE

In future work, it includes the time variant analysis of the persons. That is samples of the persons were collected at the same time. By nature of signatures, the signature of same person shows slight variations. The algorithm can be further developed to detect such variability by combining more features. The system can be more accurate if more efficient handwritten character recognition is implemented.

CONCLUSION

This project developed Automatic cheque processing with main emphasis in recognition of skilled forgery. The work can process cheques of a particular bank only. Further techniques can be developed to segment the cheque fields based on visual information rather than ROI based segmentation. The accuracy can be further improved by integrating more statistical moments like variance, skewness etc.

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