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# Offline Signature Verification for Cheque Authentication Using Different Technique

**Dr. Balaji Gundappa Hogade[1], Yogita Praful Gawde[2]**

[1]Research Scholar, NMIMS, MPSTME, Associate Professor, TEC, Navi Mumbai, India
[2]Student, M. TECH. Smt. Alamuri Ratnamala Institute of Engineering and Technology, ARMIET Sapgaon, Shahapur, Thane, India

**Abstract:** ***In this paper, we consolidate the gist of unimodal algorithms and their performance in signature verification system. Signature is an ultimate biometrics to authenticate an individual. The signatures are used in cheques, legal transactions etc to determine the individual identity. The legalization of any document takes place by putting a signature on it. This problem can be dealt in two ways: 1) Online signature verification 2) Offline signature verification in some transactions online signatures are used where the user is provided with a pen based tablet. The user has to do his signature on that tablet then that signature will be recorded in the system/computer. Signature trajectory, pen pressure, pen downs & pen ups will be captured by the tablet & sent to the system/computer. Then it will verify with the database whether it is genuine or forged one. On the other hand offline signature is the one which can be obtained by signing on the simple paper & then scanning it to the computer. Now the system will judge whether it is a genuine or forged one. Offline signature does not require any specific hardware whereas online signatures require a lot of hardware & software to determine genuineness. As a rule it is impossible to know in advance which of the approaches is novel.***

**Keywords:** extraction, gray scale, Euclidian distance, binarization, verification

## 1. Introduction

In the past few decades the technology is rapidly growing at a very fast pace. Due to the advent of computers & Internet lot of transactions are going online as well as offline. The increase in number of transactions is the boon of this latest cutting edge technology that can be done at mind boggling speed. The technology has increased the convenience but at the same time security is at the stake, lot of false transactions are going around because of forgeries done by some anti-social elements which is leading to huge financial loss to the concerned person & to the society as a whole. We need some mechanism by which we can verify that the concerned transaction is genuine & not the forged one.

Offline systems are designed because they provide various advantageous over online systems such as absence of signer during signature verification because the signed signatures are compared with template signatures already stored in the database at the time of data training. The two types of variation found in the signatures are: Inter personal and Intra personal variability. The variation among the signatures of the same person is called as Intra personal variation. This variation can be due to age, illness, time, weather or other abnormal conditions and the variation between the originals and the forgeries is called Inter personal variations. A signature forgery means an attempt to copy someone else‟s signature and use them against him to steal his identity there can be basically three types of forgeries:

- Random Forgeries: The signer just knows the name of the person whose signature is to be signed.
- Simple forgeries: The signer knows the signature shape and has seen the signature examples prior to signing.
- Skilled forgeries: The signer knows the signature shape very well and has practiced the signature prior to signing it.

Signature verification cannot be done by character recognition because the alphabets of signature cannot be read out separately and it appears as an image with some curves representing the writing style of an individual. So, a signature image can be considered as a special distribution of pixels representing writing style rather than a collection of alphabets. Thus, separate approaches were required for signature recognition and character recognition.

### 1.1 Signature Characteristics

A signature is handwritten graphical representation which is used to authenticate individuality. Signature of a person may vary according to his mood, health etc. Even the genuine signer may not replicate his own signature as it is, some minor change will be there. Hence, it is difficult to distinguish that whether signature is genuine or forged one. A person's signature often changes depending on some elements such as mood, fatigue, time etc. as an image because a person may use any symbol, line, Curve & letter or group of letters as a signature Shown in fig1. Hence a person is a perfect candidate for image processing & pattern recognition.

**Figure 1:** A sample of signatures

### 1.2. Signature Verification Basic Concept

The main phases of the signature verification follow the sequence:

(a) Pre-processing,
(b) Feature Extraction,
(c) Data Training and
(d) Signature verification.

**A: Preprocessing:** Preprocessing is the set of subsequent operations applied for the improvement of quality of

signature image. This improvement in quality of image increases the accuracy of further steps involved in processing without losing relevant information. It improves the quality of elements of the digital images called pixels**.** The various sub-processes which can be considered in image preprocessing are Binarization, Noise removal, Skeletonization, Skew removal etc. The above sub-processes may vary according to the approach used.

**B: Feature Extraction:** Feature means similar characteristics and Extraction means accurately retrieve those features. A proper feature extraction can increase the recognition ratio. It plays an important role in development of the robust system as all other phases are based on these features. This phase can be based on following types of features: Global features, Local features and Transition feature.

- Global features describe the entire signature image such as width, height, aspect ratio. These features are used in combination with other features. These features are less sensitive to noise.
- Local features describe the properties of signature image in specific parts. They are calculated by partitioning the signature image into parts by help of geometric center or some other means.
- Transition features counts the transition in the signature image from „black" to „white" pixel or vice versa in binarised signature images. It is used in combination with the above features

**C. Signature Verification**
Verification of hand-printed signature present on a paper cheque is inevitable as it carries the authenticity of the cheque. Automatic verification of signatures is essential because of the difficulty in distinguishing genuine signatures from skilled forgeries on the basis of visual evaluation. Such techniques can also be applied to verify the authentication of contracts, identity cards, formal agreements, administrative forms, acknowledgements, etc Hence, static (off-line) signature verification has become a field that attracts more and more researchers. So many techniques have been proposed in the recent past towards the offline verification of signatures.

## 2. Problem Definition

The main problem is the Signature verification and feature extraction which having many stages like feature extraction which can be done by methods like;

- Grid Based and Tree Based
- Rotation Invariant Features
- Global Features
- Feature Vector Dimension Reduction
- Feature Selection & Feature Combination

The proposed work deals with verifying the off-line signature in cheques. We have come out with an approach, which makes a pattern comparison of pixels captured within a specified boundary of signature. After acquiring the signature from the user, it has to undergo the above steps (pre-processing stages) in order to get a good quality image. A scanner digitized the signature in 256 gray levels with 400 dpi resolution and the images are stored in tagged image file format. A specimen copy of 20 signatures is acquired from each individual customers and it is stored in the database.

## 3. Research Methodology

The methodology employed for offline and online signature verification is depicted in Figure 2. The methodology involves signature acquisition, pre-processing, feature extraction and comparison with an enrolled signature template as a knowledge base to draw the decision between genuine and forged one. Each steps of the methodology is explained in the following Subsections.

**A. Image Acquisition**
Signature image acquisition is a crucial stage of any recognition system. The resolution, skew and isolated components of signature makes the problem more complex.

**B. Pre-Processing (Noise Removal)**
This involves Normalizing, Converting a grey scale image to a binary image or its vice-versa, removing of spurious pixels (noise) etc.

**C. Feature Extraction**
Features can be classified in to two types global & local. Global features describe the signature as a whole for ex: width & height of signature, width to height ratio. Local features are confined to a limited portion of the image/signature for ex: a grid of the signature.

Vigorous research has been pursued in signature verification System for a number of years. In the area of Signature verification, especially offline Signature verification, different technologies have been used and still the area is to be explored. The techniques used by different researchers differ in the type of features extracted, the training and testing methods used, and classification, verification mode

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In the proposed work following flow is used for signature verification.

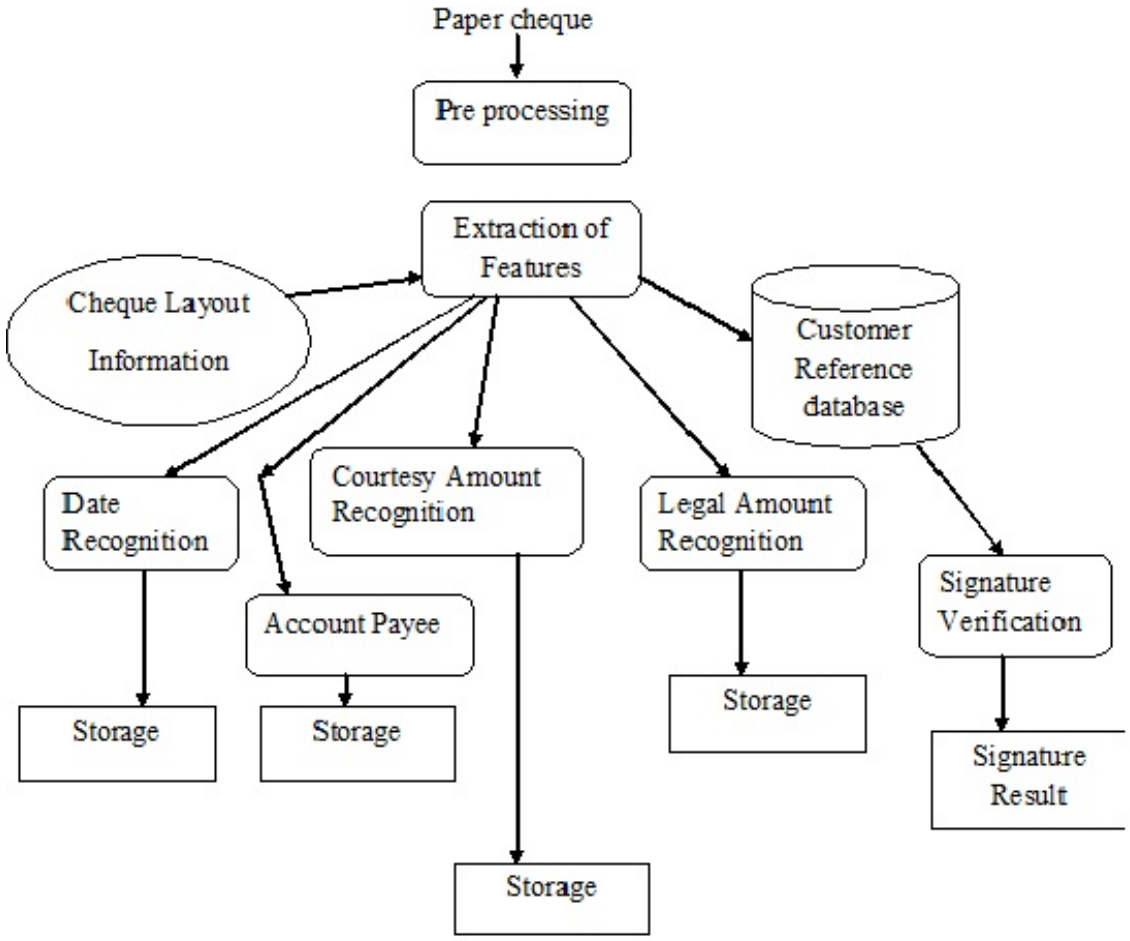


**Figure 2:** Signature verification system

Each customer shall have their sample signatures recorded and stored in the database. The images are stored in JPG format. The extraction of a signature from a bank cheque is a difficult task [7] and the cheque backgrounds are complex in nature. The cheques are scanned and compares with the signature of his/her database and comes out with a result. Signature in the cheques is compared with that of the existing database signature of that particular account. Since we have 20 specimen signatures of the same person, we have wider area of comparison. We have limited that, if 10 of them matches, then we accept else reject it. The implementation is being done in MATLAB..

## 4. Design Steps

In this section, we describe the steps for verifying the signature.

Step 1: Get the processed signature image

Step 2: Assign count = 0; matched image = 0

Step 3: Compare the processed signature images with the corresponding customer's image in the database.

Step 4: Comparing pixels of both the images. If both corresponding pixels matched, then increment the count value.

Step 5: Consider the next pixel and go to step 4.
Step 6: Repeat steps 4 and 5 until all the corresponding pixels are matched.

Step 7: If the pixel comparison is greater than 50 percentage, then increment counter value of matched image.

Step 8: If the matched image is greater than or equal to 10 then accept signature is correct.

Step 9: If the matched image is less than 10, then accept signature is incorrect.

According to above steps first we consider original image as follows:

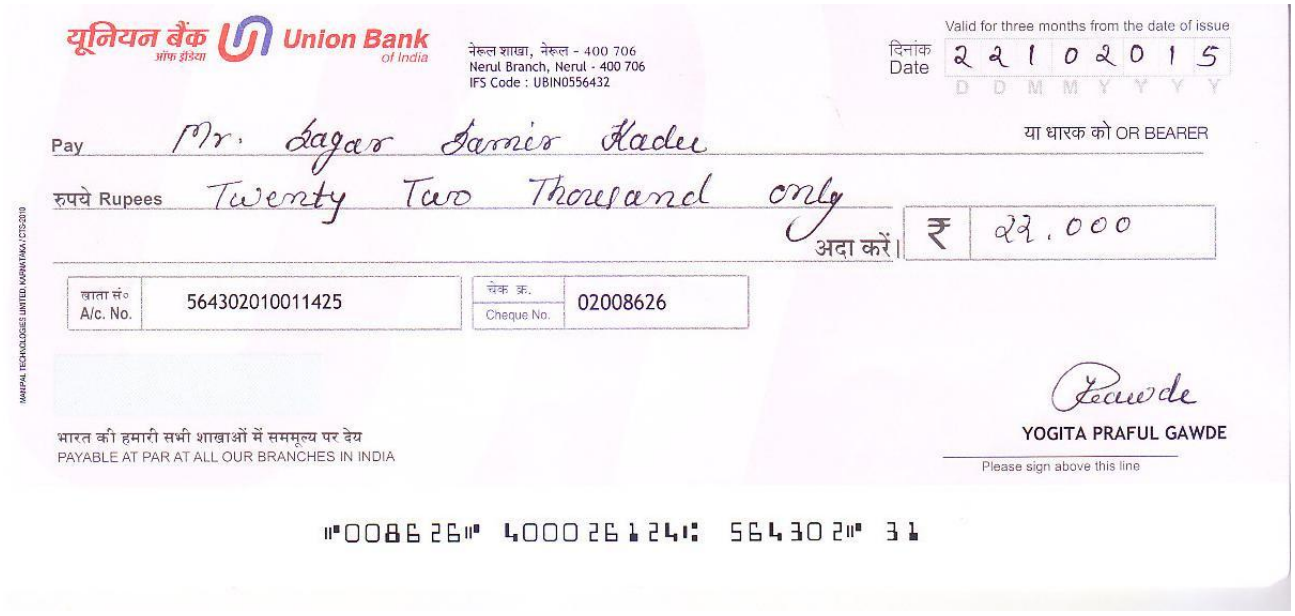


**Figure 3:** Original Image

In above figure there is some area in cheque which is redundant. This redundant area is shown in Figure 4 marked in green colour.

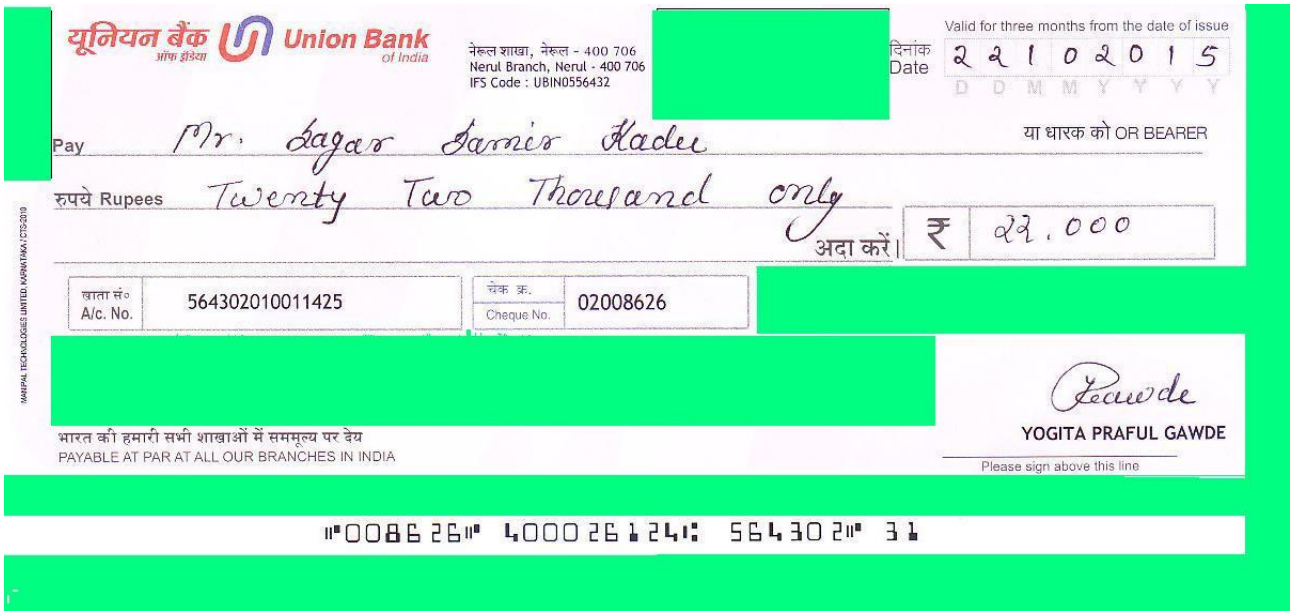


**Figure 4:** Redundant area in original image

Now in the above figure there are various fields like MICR code, Account Number, Bank logo and Cheque number these are the constant fields. These fields are shown in Figure 5.

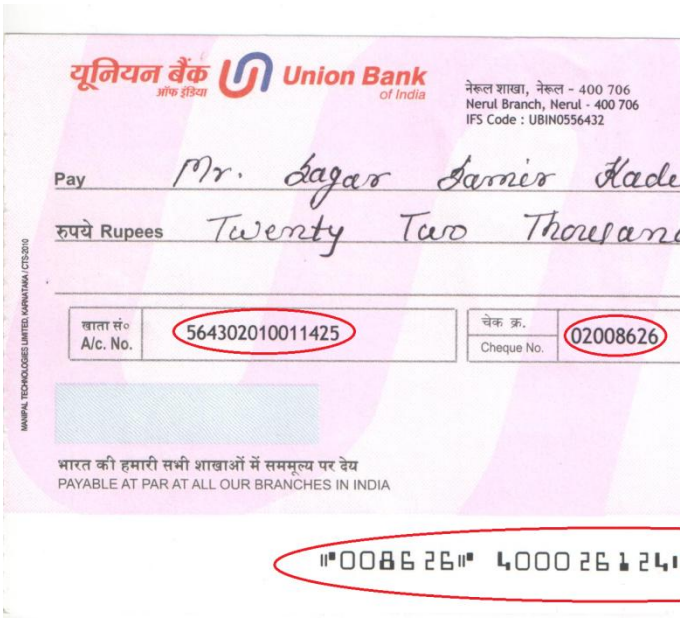


**Figure 5:** Constant Fields

Now the fields like Account payee, **Courtesy amount,** date and Legal amount are the variable. These fields are variable and depend on the customer requirement which is shown in Figure 6.

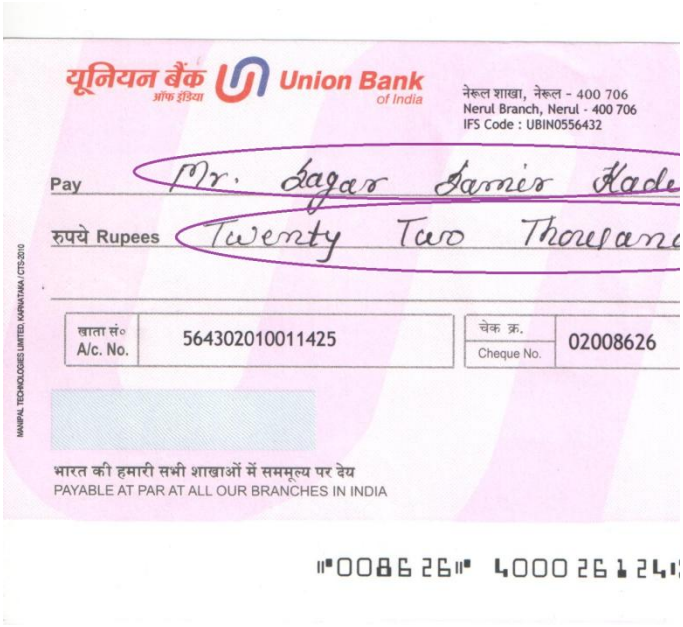


**Figure 6:** Variable Fields

Now we consider the rows. The area in which we are not writing anything means not a single constant field as well as handwritten field. Such area is shown is shown in Figure 7and Figure 8.

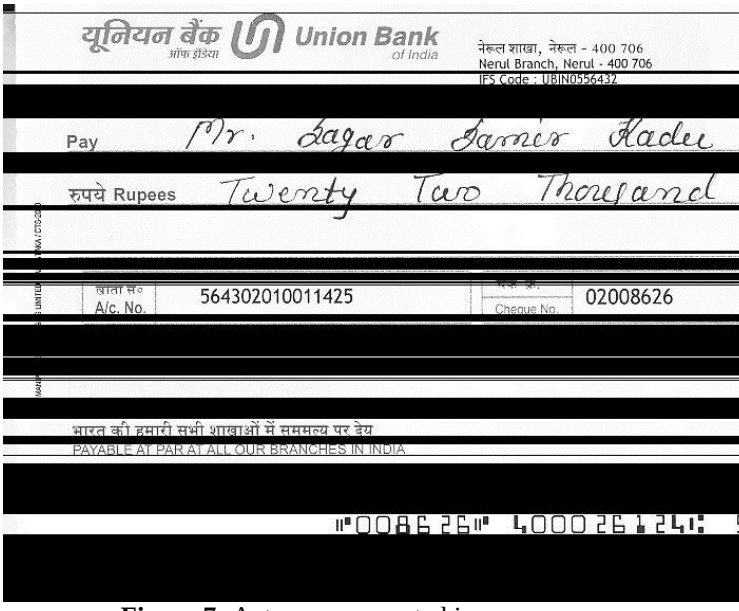


**Figure 7:** Autorow segmented image

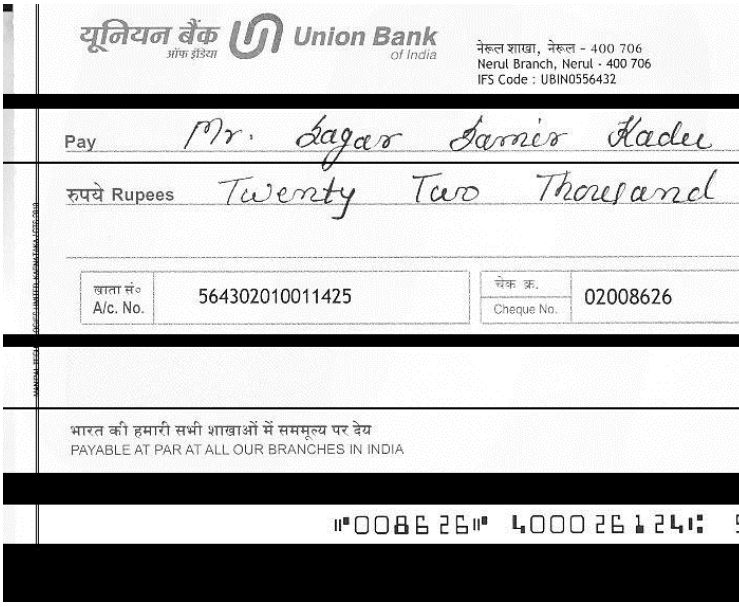


**Figure 8:** Autorow segmented image

Now we the sepeate colour pixel form original cheque. Alredy this is useful for gray scale conversion image. The original image contain RGB pixels, fom that we are separating green pixel and tahe green pixel image is shown in Figure 9.

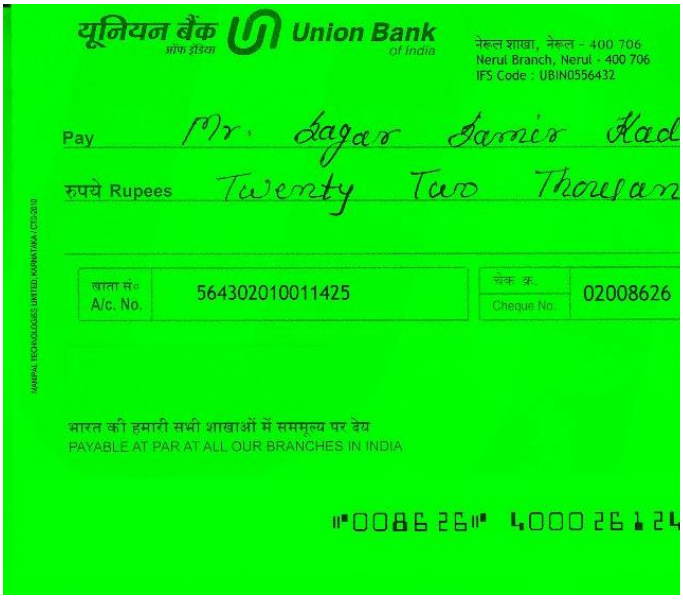


**Figure 9:** Green Pixel Image

Next we consider RED pixel image which is shown in Figure 10.

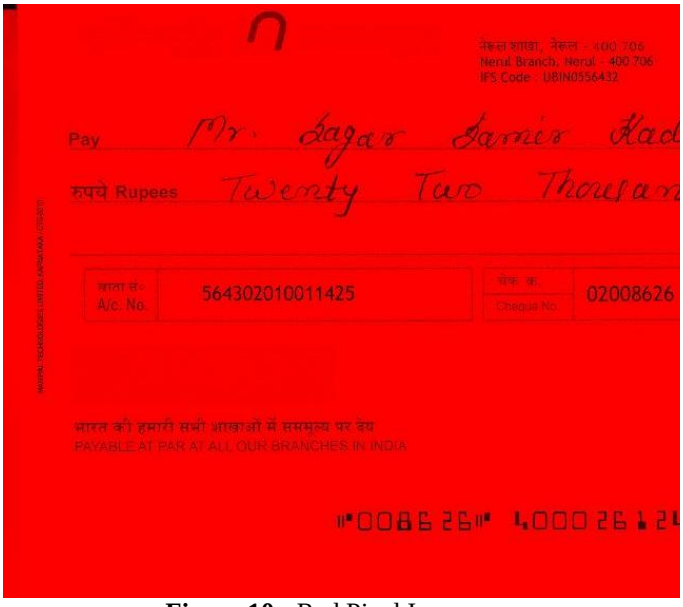


**Figure 10:** Red Pixel Image

The last one remaining is BLUE pixel image and that is shown in Figure 11.

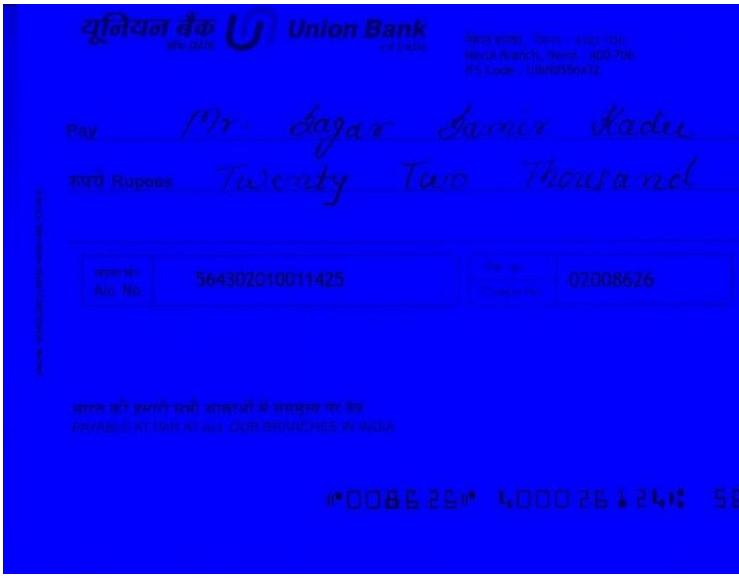

**Figure 11:** Blue Pixel Image

After getting this RGB separate images, we have to verify the signature of person which is the proposed work and that can be done in following manner.

## 5. Verification

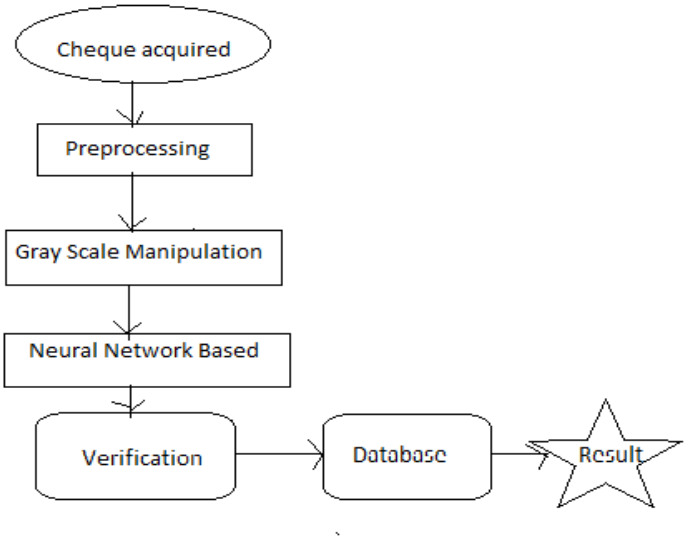


**Figure 12:** Steps involved in system

## 6. Conclusion

The proposed signature verification system is been based on some special features Extraction. Signature scan has several strengths. Because of the large amount of data present in a signature scan template, as well as the difficulty in mimicking the behavior of signing, signature scan-technology is highly resistant to imposter attempts. However, signature-scan has several weaknesses. A pseudo-outer product-based fuzzy neural network drives the signature verification system [6]. Signature-scan is designed to verify subjects based on the traits of their unique signature. As a result, individuals who do not sign their names in a consistent manner series of signatures that is similar enough that the system can locate a large percentage of the common characteristics between the

enrolment signatures. This technique can be added with any existing verification system for better result.

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