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Offline Bank Cheque Signature Verification Using SIFT

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***Abstract*: In today's era, signatures are the most widely established form of biometric identity verification. Signature verification is a extensively and commonly accepted tradition for authentication of an individual. Intesive reserch has been done on offline bank cheque signature verification. In current times, the signature recognition schemes are rising in the world of security technology. Hand written Signature of a person is also unique and for identification of humans are being used and accepted specially in the banking and other financial transactions. Signature plays a vital role in banking, legal and business documents. The first step to verify any document is signature. Every signer has his unique sign. Signatures present a secure means of verification and authorization in documents. The unexpected spreading of the internet in our daily life as well as rising requirement of personal verification in many daily applications, signature verification systems for authorization and authentication have become enormously important in every sector due to increasing concerns for security. Forgeries are growing extensively day by day. To prevent the imitation of signature it is very necessary to make a system to verify original signature or forged one. Signature verification attracts the researcher to develop a forged free system due to immense use of signature. This paper presents some of the most relevant advances in the field of offline signature verification and highlights some directions for further research. In our thesis we verify bank cheque signature by using scale invariant feature transform (SIFT) algorithm. SIFT algorithm is invariant from space and scale. The offline bank cheque signature verification is implemented using MATLAB. In This first we find key points and their location. Then find distance between key points. When maximum key points match our result is shown. The accuracy of purposed system is 94%.**

***Keywords*: Bank Cheque, Character Recognition, Image acquisition, Key Points, RGB.**

1. Introduction

In today's era signature verification is used for personal identification everywhere. Biometrics is extensively implemented in today's world to deal with the security requirement issues. A signature verification task can do identification and verification. In identification, the system can establish identity of a person whereas verification authenticates the person's claimed identity from the sample stored in the database. Handwritten signatures of a person are socially and legally accepted as an appropriate means of signer's verification. Signature verification offers a speedy, easy and cost effective means for validating the authenticity of a document by determining the difference between an original signature and a forgery. Signature is the cheapest and easiest way to authenticate a person. Each and every document has the signature on it to identify the signer. Every signer has unique signature style and orientation. A person's signature is constant, unique and also difficult for others to copy. His/her handwriting may vary due to aging factor, sickness, unusual conditions, mood but the width-height ratio of the signature does not differ. In case a signature is forged, one can find it out by using certain basic things. If a signature is forged, the density of the ink will be high at the point where the forger stops for verification with the original one. After the pause, the beginning stroke will be heavier. The purpose of Handwritten Signature Verification System is to verify the identity of an individual, based on the analysis of their signature through a process capable of distinguishing between an authentic signature from a forged one [1].

Signature can be used anywhere to give our personal identity. It can also be used in places where we need to give our permission or authorization. For financial transactions signature plays a vital role. The objective of the signature verification system is to discriminate between two classes: the original and the forgery, which are related to intra and interpersonal variability [2]. The variation among signatures of same person is called Intra Personal Variation. The variation between originals and forgeries is called Inter Personal Variation. Many times we sign cheques for the purpose of money retrieval. Our signature is also essential in places where our agreement or any permission is required. But many a times our signatures are on the pin point of frauds. Many times our signatures are misrepresented for money. Some people imitate our signatures with target to make money. Even though this is a punishable crime we need to control it. Whenever we want to retrieve money from bank we use cheques for that purpose. Usually the cheque is taken in the back room and then it is verified manually by a person present over there using our previous documents which are signed and stored. This is called manual verification. Although our sign can be digitally processed and verified, banks have adopted the paper filling process. Whenever a cheque comes for clearance, it is taken for verification of signature in the back room, for manual signature verification. But again when manual verification comes into

account the question of accuracy arises. The accuracy of manual verification depends on the skill and experience of the bank personnel. In order to increase the accuracy, a system is designed to process the handwritten signatures and verify for its correctness.

To design and develop an offline bank cheque signature verification system that will differentiate between original signature and closer forge signature depending on some special features. Signature recognition and verification task is implemented in MATLAB. Here we used few images in the database them we will compare our new signature image with those and will tell if the signature matches or not. Signature verification techniques utilize many different characteristics of an individual's signature in order to identify that individual. The advantages of using such an authentication techniques are,

i. Signatures are extensively accepted by society as a form of identification and verification.
ii. Information required is not sensitive.
iii. Forging of one's signature does not mean a long-life loss of that one's identity.

Signature verification is so dissimilar with the character recognition, because signature is often unreadable, and it seems it is just an image with some particular curves that symbolize the writing style of the person. Signature is just a special case of handwriting and often is just a symbol. So it is intelligence and essential to just deal with a signature as a complete image with special distribution of pixels and representing a particular writing style and not as a collection of letters and words [3].

Many researchers are dedicated to improving the Performance of image matching techniques, and have proposed a variety of algorithms [10]. The image matching algorithms can be divided into two categories: global feature-based matching algorithms and local feature-based matching algorithms [11]. Comparing with global feature based matching algorithms; local feature-based matching algorithms are more stable. They have been applied successfully in many real-world applications, such as object recognition, texture recognition, image retrieval, robot localization, video data mining, building panoramas, and object category recognition [12]-[14].

David G.Lowe proposed a local feature description algorithm SIFT (Scale-invariant Feature Transform) [15], [16] based on the analysis of existing invariance-based feature detection methods at that time. SIFT has good stability and invariance.

It detects local key points, which contain a large amount of information. Because of its unique advantages, it has become a popular research topic.

Various pattern recognition techniques have been exploited to authenticate handwritten signatures. These techniques include template matching techniques [17, 19, 21], minimum distance classifiers [20, 22, 24, 25], Neural networks [28, 23, 26], hidden Markov models (HMMs) [27, 28], and structural pattern recognition techniques.

2. Methodology

To perform offline bank cheque signature verification a general process is followed. The centre of attention of the present work is to design an enhanced version of off-line signature verification system, which can be used to separate genuine signature from forgery. To achieve that, various types of operations are performed and find out that image is match or not with previously stored images. Here some images are stored in database previously. When we want to identify a new image we load this image for testing purpose and apply all the operations to perform verification process. If image is match with any of database image then our system show match with database otherwise show no match found. This implementation is performed in MATLAB.

A. Image acquisition

The process of selecting the image and giving to the system as input is called image acquisition. Signatures can be captured by a camera or it can be scanned by a scanner. Here we use previously stored images. Here we perform offline bank cheque signature verification so we use previously stored check also. We perform offline method so we use old images of cheque. From taking the picture from camera we always careful about megapixel of camera. The quality of camera is good. When we scan the images we should try to use good quality of scanner. When we select the cheque we care full about that signature is at proper place or not. The signature and other cheque value is not overlapped. We always take proper and clear signature images. These signature images are stored in our database.

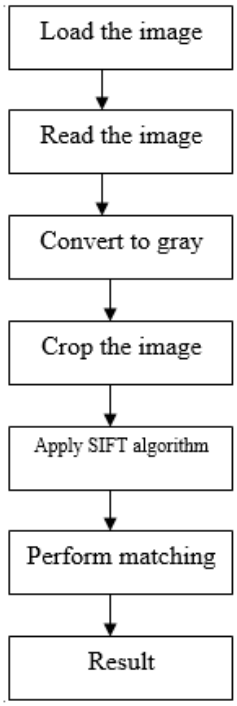

Fig. 1. Signature verification process

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B. Read an image

In this process we read the image and show the original image before pre processing. Here we read the image. Images have different file formats. All the formats are read in this process. Here we use read and show command to perform this task.

$$x = imread('imagename.format');$$
$$imshow(x)$$

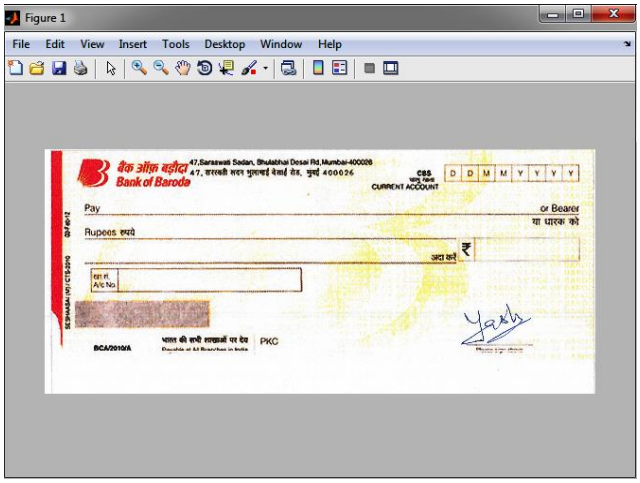

Fig. 2. Original image

C. Convert to gray image

When we implement an image generally we use gray scale image or black and white image. So when the image is RGB format means red, green and blue color images are convert to gray scale image. For the conversion we use rgb2gray command. From this conversion RGB image is convert into gray scale image.

$$gray = rgb2gray(imagename);$$
$$imshow(gray)$$

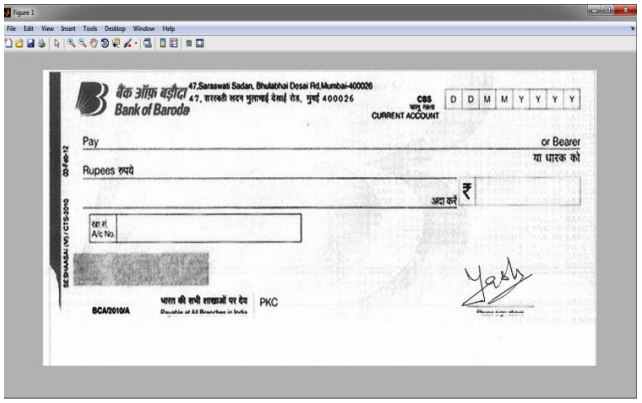

Fig. 3. Gray scale image

D. Crop the image

In offline bank cheque signature verification we perform all the operation on bank cheque. So when we check matching operation it would only match only signature portion of cheque otherwise it will be match whole cheque image. So for this purpose we crop the cheque image where signature is available.

$$data = imcrop(data, [[1432\ 611\ 866\ 422]]);$$

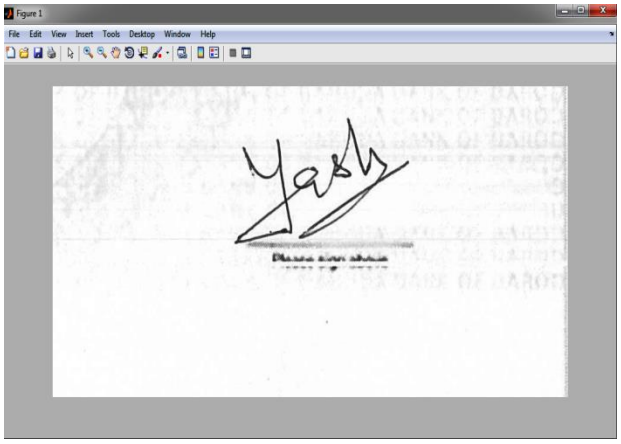

Fig. 4. Crop the image

E. SIFT algorithm

Since the SIFT algorithm was formally proposed, researchers have never stopped improving it. According to the statistics of references in Google Scholar, the article [4], which published the SIFT algorithm, has more than 12,000 references. Among its variants, the numbers of references of PCA-SIFT [5], GSIFT [6], CSIFT [7], SURF [8] and ASIFT [9] are relatively high.

SIFT is scale invariant feature transform technique which is invariant from scale and space. In SIFT algorithm first of all we select key points of an image. These key points are selected by difference of Gaussian (DOG). Once DOG image have been obtained key points are identifies as local maxima or local minima. This is complete by comparing each pixel in the DoG images to its eight neighbors at the similar scale and nine corresponding neighboring pixels in each of the neighboring scales. Then key points localization is performed. In selection of key points too many key points are selected in which many are unstable. So in this stage rejected those unstable key points. Then one or more orientations are assigned to each key point location based on local image gradient directions. All future operations are performed on image data that has been transformed relative to the assigned orientation, scale, and location for each feature, thereby providing invariance to these transformations. A key point descriptor is computed for the local image region that is as distinctive as possible at each candidate key point. The image gradient magnitudes and orientations are sampled around the key point location.

In our algorithm we constant four parameter which is distance ratio, threshold value, distance ratio increment or threshold decrement. Here we initialize the critical parameter.

$distratio = 0.65;$
$threshold = 0.035;$
$distratioincrement = 0.05;$
$thresholddecrement = 0.005;$

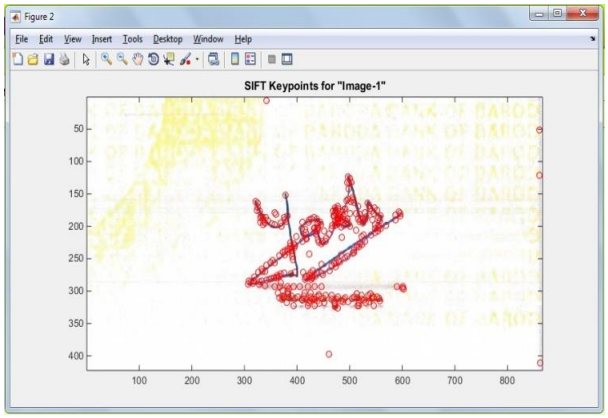

Fig. 5. SIFT key points for image-1

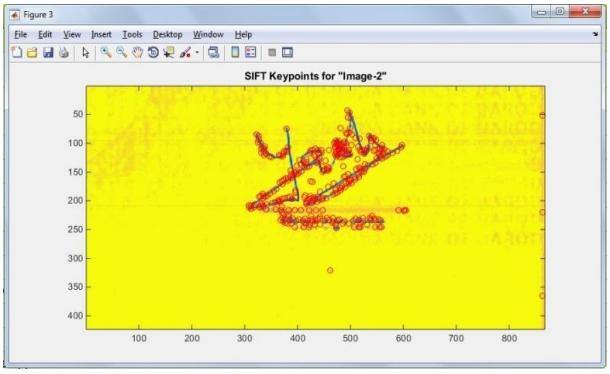

Fig. 6. SIFT key points for image-2

3. Result

In offline bank cheque signature verification we performed verification task on MATLAB tool. In this process we used SIFT algorithm which is invariant from scale and space. In this process we first make a database of previously stored cheque images. Then further precedes these cheques. In next step we convert our image into gray scale images. In the cheque signature is done on specific place which are similar to almost all cheques. So we crop the particular area where signature is performed. Then we apply the SIFT algorithm which work only local features. In SIFT we find key points and calculate distance between key points using dot vector method. From this when we test the signature with stored signature it shows result:

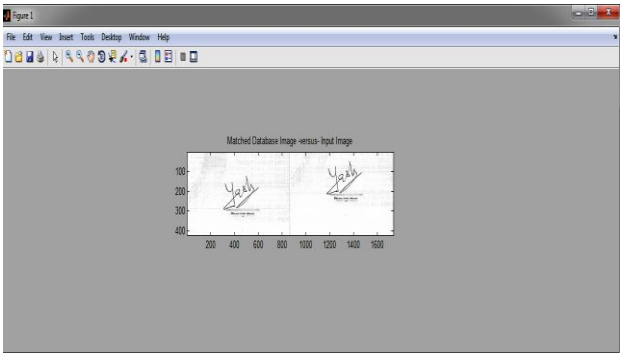

Fig. 7. Matched image

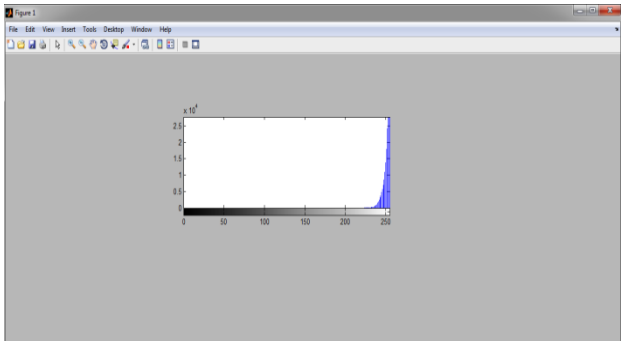

Fig. 8. Histogram of input image

4. Conclusion

In our paper we perform the offline bank cheque signature verification scheme. In this paper we briefly describe the work which is done previously on signature verification. We use SIFT algorithm which is use local features of an image. Her we use only local features of images. Here when we start matching process input image is matched with all stored image. When Maximum key points of input image is match with other stored image match process is successful otherwise input image is not match. The accuracy of proposed system is 94%.

5. Future Scope

In this proposed system we use small database we can also use a large database of images. SIFT perform best under the condition of scale and rotation change. But for other variation its accuracy is lower. For this we use SIFT variant for other changes in images. SIFT is work only local features of images. In future we will try to make a novel method to combine local and global features of an image.

We can also use SIFT with different type of classifiers. Several classifiers are available for verification process. We improve accuracy by using any classifier.

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