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Hindi Signature Recognition Review

Harpreet Kaur
Research Scholar, Department of Computer Engineering
SGGSWU, Fatehgarh Sahib
India
harpreet0399@gmail.com

Simarjeet Kaur
Department of Computer Engineering
SGGSWU, Fatehgarh sahib
India
er.simarjeet@yahoo.in

Abstract **-** Biometric system has been actively emerging in various industries for the past years, and it is continuing to roll to provide higher security features for access control system. Handwritten Signatures are one of the widely used biometrics for document authentication as well as human authorization. The purpose of this paper is to present an offline signature verification system involving Hindi signatures. Signature verification is a process by which the questioned signature is examined in detail in order to determine whether it belongs to the claimed person or not. Verification can be performed either Offline or Online based on the application. Online systems use dynamic information of a signature captured at the time the signature is made. Offline systems work on the scanned image of a signature. In this paper, we present a method for an off-line signature verification system involving Hindi signatures.

Keywords - Signature verification, Hindi Signature, Document authentication, personal identification.

I. INTRODUCTION

Biometric verification techniques require a user to present identifying information based on an unchangeable personal feature. It is the science of identifying a person using one's physiological or behavioral characteristics. The physiological traits include fingerprint, face, finger vein, iris, hand geometry, palm print, retina, etc, and the behavioral traits include gait, voice, signature, etc. Handwritten signatures are one of the most widely accepted personal attributes for identity verification. The written signature is regarded as the primary means of identifying the signer of a written document based on the implicit assumption that a person's normal signature changes slowly and is very difficult to erase, alter or forge without detection[6]. The handwritten signature is one of the ways to authorize transactions and authenticate the human identity compared with other electronic identification methods such as fingerprints scanning and retinal vascular pattern screening. It is easier for people to migrate from using the popular pen-and-paper signature to one where the handwritten signature is captured and verified electronically. The authentication based on handwritten signature verification system as it is the cheapest way to authenticate a person. Banks and Government bodies recognize signatures as a legal means of authentication. Signature verification technology utilizes the distinctive aspects of the signature to verify the identity of individuals[7]. A handwritten signature is biologically linked to a specific individual. Modern forensic document examiners commonly compare a suspect signature with several examples of known valid signatures. They look for signs of forgery which include: Signatures written at a speed which is significantly slower than the genuine signatures; frequent change of the grasp of the writing implement; rounded line endings and beginnings; poor line quality with hesitant and shake of the line; retracing and patching; and stops in places where the writing should be free. Compared with other electronic identification methods such as fingerprints scanning and retinal vascular pattern screening, it is easier for people to migrate from using the popular pen- and paper signature to one where the online handwritten signature is captured and verified electronically[9]. Signature verification problem therefore is concerned with determining whether a particular signature truly belongs to a person or not. A robust system has to be designed which should not only be able to consider these factors but also detect various types of forgeries. The system should neither be too sensitive nor too coarse. It should have an acceptable trade-off between a low False Acceptance Rate (FAR) and a low False Rejection Rate (FRR)[1]. The objective of signature verification is to discriminate between two classes: original and forgery, which are related to intra and interpersonal variability. The variation among signature of same person is called Intra personal Variation The variation between originals and forgeries is called Inter Personal Variation. Signature verification is so different with the character recognition, because signature is often unreadable, and it seems it is just an image with some particular curves that represent the writing style of the person. So it is wisdom and necessary 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. The verification system must be able to detect forgeries and at the same time reduce rejection of genuine signatures [4]

A. Signature verification systems can be classified into two categories:-

1) On-line
2) Off-line

1) In an On-line technique, signatures are signed on a digitizer and dynamic information such as speed and pressure is captured in addition to a static image of the signature [4]. Online handwritten signature is usually obtained on an electronic tablet and pen. Online signature verification track down path and other time-variable sequence variables using specially designed tablets or other devices during the

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act of signing. Automatic online signature verification is an interesting intellectual challenge with many practical applications[6]. This technology examines the behavioral components of the signature such as: stroke order, speed, and pressure, as opposed to comparing visual images of signatures.

2) **In a Offline** signature verification deals with a 2D static image record of the signature. It is useful in automatic signature verification found on bank checks and documents authentication. In offline systems, signature is digitized using flatbed scanner and then stored as an image [6]. It extracts static features, which are of three types:-

(i) *Global features:* provide information about specific cases of the signature shape such as signature area, signature height-to-width ratio, maximum horizontal and vertical histogram, horizontal and vertical center of the signature, horizontal and vertical local maxima numbers of the signature and number of edge point of the signature.

(ii) *Mask features:* provide information about direction of the signature stroke i.e., skew angle of the signature.

(iii) *Grid features:* are used for finding densities of signature parts. The various approaches for offline signature verification are based on neural networks, parallel processing, 2-D transform, histograms of directional data or curvature, horizontal and vertical projections of the writing trace of the signature, local geometric information, shape of the signature, the position of feature points located on the skeleton of signature and global shape descriptors.

B. **Types of Forgeries: -** The forgeries involved in handwritten signatures have been categorized on their characteristic features. We have also attempted to classify the various kinds of forgeries into the following types:-

1) Skilled forgery- signature forger knows the signatory name and the shape of the original signature. The most difficult of all forgeries is created by professional imposters or persons who have experience in copying the signature.
2) Simple forgery- a signature forger knows just the name of the signatory without any previous examples. The signer imitates the signature in his own style without any knowledge of the spelling and does not have any prior experience.
3) Random forgery- signatures which are signed without any knowledge about name and signature shape. The signer uses the name of the victim in his own style to create a forgery known as the simple forgery or random forgery.

Signatures may be written in different languages and there is a need to undertake a systematic study in this area. A few studies have been undertaken for signatures written in Chinese, Japanese, Persian, Arabic etc. [9]. The present work of Hindi signature verification would be considered as a novel contribution to the field of signature verification. Although automatic signature verification has been an active research area for several decades, there has been no publicly available signature database for Hindi, the most popular official Indian script. Therefore, a Hindi signature database was created for the purpose of this work. So, the research in automatic signature verification has long been constrained by the unavailability of a standard database. The signatures of Hindi script were considered for this signature verification approach. In order to collect the genuine signatures corresponding to each individual a collection form was designed. The form contained 24 boxes where the signatures could be written[1]. The form contained 24 boxes where the signatures could be written. From each individual, 24 genuine signatures were collected. The complete signature verification is split into four stages: signature acquisition, preprocessing, feature extraction and matching. The signature acquisition step captures the images of signatures. Preprocessing step involves removal of noise and skeletonization for making the acquired signature suitable for feature extraction. The preprocessing stage includes two steps: Color inversion and Filtering and Binarization. The true color image RGB is converted to the grayscale intensity image by eliminating the hue and saturation information while retaining the luminance.

Then the preprocessed image is used to extract relevant features that can distinguish signatures of different persons. The extracted features are used to verify a given signature image. The signatures to be processed by the system needed to be in a digital image format. Each signature was handwritten on a rectangular space of fixed size on a white sheet of paper. It was necessary to scan all signature document pages[1]. At the very beginning, the images were captured in 256 level grey scale at 300 dpi and stored in TIFF format (Tagged Image File Format) for the purpose of future processing. In the pre-processing step, a histogram-based threshold technique was applied for binarization. the digitized grey-level image is converted into a two tone image. Then the signature images were extracted from the signature-collection document forms. The signature collection form containing 24 genuine signatures in grey level. The extracted binary signature images were stored in TIFF format. The zones (upper, middle and lower). The upper zone denotes the portion above the headline, the middle zone denotes the portion between the headline and baseline and the lower zone is the portion below the baseline. The imaginary line separating the middle and lower zones is called the baseline.

Feature extraction is a crucial step in any pattern recognition system. The Zernike feature and the gradient feature extraction technique are used for feature extraction. Support Vector Machines (SVMs) use as classifiers.[4] SVMs have been originally defined for two-class problems and they look for the optimal hyper plane, which maximizes the distance and the margin between the nearest examples of both classes, namely support vectors (SVs).

II. LITERATURE SURVEY

1. **Ms. Vibha Pandey** [1] proposed Signature Verification Using Morphological Features Based on Artificial Neural Network. In this paper, off-line signature recognition &

verification using neural network is proposed, where the signature is captured and presented to the user in an image format. A Feed Forward Neural Network will be used for verifying signatures and to determine its accuracy. Signatures are verified based on parameters extracted from the signature using various image processing techniques. This paper will be completed when the utility of signature verification is shown and helps in detecting the exact person and it provides more accuracy of verifying signatures as compared to prior works. For implementation of above this paper uses Feed Forward Neural Network (FFNN) for recognition and verification of signatures of individuals.

2. **Pradeep Kumar** [2] proposed Hand Written Signature Recognition & Verification using Neural Network. Handwritten signatures are considered as the most natural method of authenticating a person's identity. A signature by an authorized person is considered to be the "seal of approval" and remains the most preferred means of authentication. However human signatures can be handled as an image and recognized using computer vision and neural network techniques. The method presented in this paper consists of image prepossessing, geometric feature extraction, neural network training with extracted features and verification. A verification stage includes applying the extracted features of test signature to a trained neural network which will classify it as a genuine or forged. The network could classify all genuine and forged signatures correctly. However, it exhibited poor performance when it was presented with signatures that it was not trained for earlier. Generally the failure to recognize/verify a signature was due to poor image quality and high similarity between 2 signatures. This study aims to reduce to a minimum the cases of forgery in business transaction.
3. **Ashwini Pansare** [3] proposed Off-line Signature Verification Using Neural Network. The method presented in this paper consists of image prepossessing, geometric feature extraction, neural network training with extracted features and verification. A verification stage includes applying the extracted features of test signature to a trained neural network which will classify it as a genuine or forged.
4. **Nilesh Y. Choudhary** [4] proposed Signature Recognition & Verification System Using Back Propagation Neural Network. Verification can be performed either In this paper, off-line signature recognition & verification using back propagation neural network is proposed, where the signature is captured and presented to the user in an image format. Signatures are verified based on features extracted from the signature using Invariant Central Moment and Modified Zernike moment for its invariant feature extraction because the signatures are Hampered by the large amount of variation in size, translation and rotation and shearing parameter. Before extracting the features, pre-processing of a scanned image is necessary to isolate the signature part and to remove any spurious noise present.

III. Conclusion

This paper presents an investigation of the performance of a signature verification system involving Hindi off-line signatures. The surf feature and NN classifiers were employed, and encouraging results were obtained. In addition, the times of simulation and testing in the ANN application are minimal and the verification system based on ANN is able to learn different kinds of signature datasets, by using only geometrical offline features.

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