Handwritten Signature Recognition and Verification Using Neural Network Based on Moment Invariance

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Abstract- *Signature verification and recognition is used for personal as well as for different identification. But, such systems have certain issues of authenticity. So for verification we need to build either Online or Offline based application. Out of this two systems Offline one works on the scanned images whereas Online systems considers dynamic characteristics of signatures signed by signatory like pen pressure, time. In this paper, we present an offline signature verification technique for which we perform preprocessing of a scanned signature specimen to isolate the signature and to remove noise. After which the system is trained using database of signatures specimens obtained from authenticated users. In order to determine the authenticity of the user we perform the verification of the system with help of neural network based on the back propagation algorithm. Simulation results shows that the technique is robust and clearly differentiates between genuine and forgery signatures.*

I. INTRODUCTION

With the new advances in the computing technology, many pattern recognition tasks have become automated. These include tasks naturally performed by humans, such as speech and handwritten signature recognition. A signature may be termed a behavioral biometric. It is mostly used to identify a person carrying out daily routine procedures, i.e. bank operations, document analysis etc by using his handwritten signature. Automatic signature recognition system and verification system has many applications as a symbol of authorization, especially in the event of credit card validation, land purchases, legal documents, and security systems. As we see in abstract, based on static and dynamic characteristics signature verification system there are two types On-line and Off-line. As the number of features, which may be extracted from Off-line mediums, surpass those obtained from On-line verification. Signature verification is an important research area in the field of personal authentication. The validity of human handwriting is important with reference to improve the interface between human beings and computers. If the computer is intelligent enough to perceive human handwriting it will provide a more attractive and economic Man-computer interface. A robust system has to be designed which should not only be able to contemplate these factors but also discern various types of forgeries. In this, area signature is a noteable case that provides secure means for authentication, attestation authorization in many high security environment. The actual aim of the signature verification system is to distinguish between two classes: the original and the forgery, which are related to intra and interpersonal variability. The variation among signatures of similar person is called Intra Personal Variation. The variation between originals and forgeries is called Inter Personal Variation.

II. AIM AND OBJECTIVE

This framework is used for signature verification and recognition.

III. SCOPE

A signature verification system which is reliable is an important part of law enforcement, security control and many business processes. It can be used in many applications like cheques, certificates, contracts etc. As it is an offline signature verification system so we need to work with only static image. So it is difficult to find out dynamic properties from it. But further research work can go ahead to find out some dynamic features from static signature `image . In the following proposed system a number of features are mentioned, some of them are implemented but few are not yet. Also other features can be found out to make a genuine signature difficult to be copied. Scanned signature should be clear. Too many noise or remove portion of signature can't be analyzed. Signatures of a same person should not differ a lot.

IV. LITERATURE SURVEY

1. OFFLINE AND ONLINE SIGNATURE VERIFICATION SYSTEMS:

In recent years, due to the extraordinary wide spread of the internet in our daily life and simultaneously increasing need of personal verification in many daily applications has driven an important aspect, Signature Verification System. This paper presents the survey about the offline & online signature verification system. In both offline and online

signature verification Feature Extraction is the most important stage. The successful implementation of any such verification system depends mainly on how effectively the features have been extracted & used for classification. The robust features yield a successful verification system. Therefore,in this paper, focus is put up on with various feature extraction techniques & classifiers employed by various authors to attempt signature verification system.

2. Signature Verification System Using Statistics Analysis:

The proposed signature verification algorithm flows. It consists of input data acquisition, feature extraction, generation of template, and classification method. In this paper, samples are uniformly re-sampled at equal interval points along the signature curve. Also when, preprocessing is carried out, here they re-sample signature curve in such a way so that it can retain the critical points while they didn't perform any preprocessing. In this work, we didn't preprocess the raw data because the same equipment are used throughout the period of data collection. Here a new technique for dynamic signature modeling and classification framework is proposed. The variation in signature of same person is obtained for effective signature training and accurate classification of genuine signature against all kind of forgeries.

3. Retail Applications of Signature Verification:

The pronounced rise in identity theft, the ever pressing need to provide ease in checkout services to attract and retain loyal customers, and the growing use of multi-function signature captures devices in the retail sector provides favorable conditions for the deployment of signature verification in retail settings. In this paper we present report on the development of a SV system to meet the needs of the retail sector. Database of approximately 10,000 signatures collected from 600 subjects and forgers. Previous work at IBM on SV has been merged and extended to achieve robust performance on pen position data available from commercial point of sale hardware, achieving equal error rates on skilled forgeries and authentic signatures of 1.5% to 4%.

V. PROPOSED SYSTEM

We know that in order to perform the three steps of preprocessing, feature extraction and verification we need to refine the signature to remove noises and derive a usable format.

Proposed system consists of following steps:

- Signature Acquisition
- Signature Pre-processing .
- Feature point Extraction
- Neural Network Training
- Signature Testing
- Signature Verification

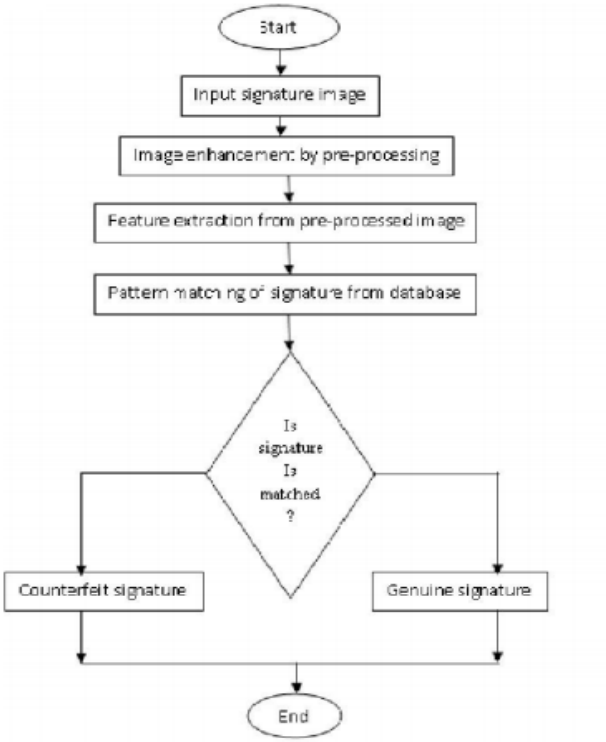

Figure 1. Flow OF System

Signature Acquisition:

The proposed scheme is based on off-line signature verification where we have collected datasets consisting of Signature samples, both genuine and forged. Signatures are scanned in RGB format.

Signature Pre-processing:

To verify signature correctly, pre-processing phase is required. After signature acquisition, image may contain noise (extra pen dots), blurriness. It is necessary to remove these extra pixel or blurriness. The pre-processing stage includes five steps: Gray Scale, Threshold and rotation, Thinning, Boundary Detection and Auto cropping will perform segmentation which will focus on a particular part which we want to analyses. Next is feature extraction in which we will extract the focused part. We will store this image for the future comparison.

Feature Extraction: This step is carried out in order to determine the edges and curve features of a particular

signature specimen. For this we use techniques that derives this features:

1. Gabor transformation

It extracts Gabor features of input signature specimen. It detects the edges of the given image by creating a column vector of features.

2. Hu moment

It is used to determine Hu moments of image which selects the region of interest from the given image and give those values.

Neural Network Training:

Original signature‘s extracted features points are then fed to neural network using back propagation algorithm.

1. Initialize Setting: In this stage, we build neural network according to the network model.(input units, output units).
2. Generate Training Set: The matrix and the signature label are saved in an array, which will be then used for training the proposed system.
3. Create Neural Network: In this step, the sample set generated from previous step is fed to multilevel network consisting of hidden layers to minimize errors. The data flow direction can be chosen to be either forward or backward.
4. Initialize Network: This stage specifies the weights which are available on every connection
5. Training Process: : We fed the algorithm and training sets to the system to get the desired output based on inputs.
6. Recognition Process: After the training process is finished, the network becomes ready for the signature recognition process. The signature to be recognized is fed into the system.

Signature Testing:

Here signature to be tested is firstly scanned in gray then pre-processed it. After pre-processing feature extraction is performed to obtain feature points. These features are then fed to trained neural network using multiple layer feed forward algorithm.

Signature Verification:

In proposed system, we get total features based on feature extraction process these features helps to classify whether the signature is genuine or fake.

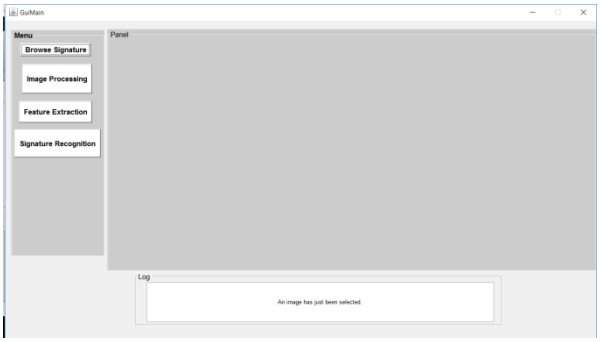

Figure 2. Home Page

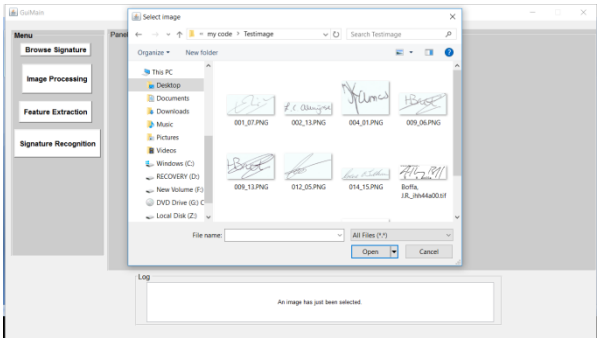

Figure 3. Browse Image

Figure 4. Image Preprocessing

Figure 5. Feature Extraction

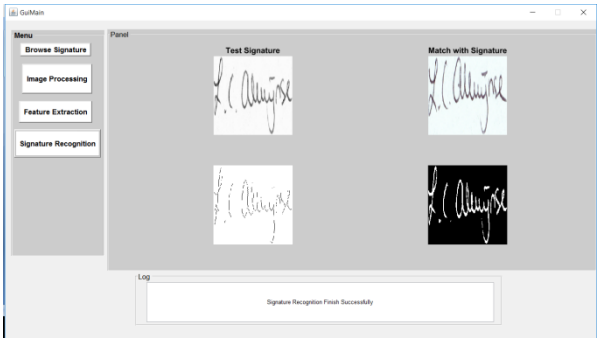

Figure 6. Signature Match Found

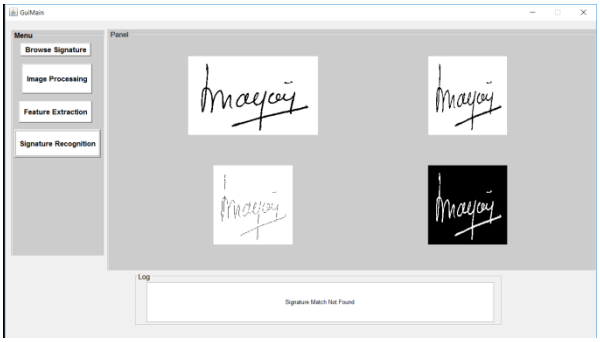

Figure 7. Signature Not Match Found

IV. CONCLUSION

This project presents a method of offline signature verification using artificial neural network approach. Signatures are verified based on features extracted from the signature before which various image processing techniques are performed to refine the image. For further verification the extracted features are used to train a neural network using back propagation training algorithm. The system is robust enough to identify genuineness for the signature specimen. The concepts of Neural Networks hold a lot of promise in building systems with high accuracy.

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