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Different Techniques Used for the Signature Verification of Bank Cheques

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ABSTRACT: Personnel authentication by handwritten signature is the most widely accepted and cost-effective method. It can be validated through both online and offline methods. Signatures, unlike characters, differ each time due to their behavioral biometric feature. The shape of a signature can be used to identify it. Moments are useful shape descriptors because they are both translational and scale invariant. This paper provides different techniques like Artificial Neural Network (ANN), Hopfield neural network (HNN), Haar Cascade Classifier (HCC), Back-propagation algorithm, Support vector machine (SVM), Hidden Markov Model (HMM), etc. used for the signature verification from Bank Cheques or documents in the recent years.

KEYWORDS: Signature Verification, Artificial Neural Network (ANN), Hopfield neural network (HNN), Haar Cascade Classifier (HCC), Back-propagation algorithm, Support vector machine (SVM), Hidden Markov Model (HMM).

I. INTRODUCTION

Automatic signature verification is a growing topic of study with a wide range of practical applications, from access control to sensitive resources and law enforcement to check and credit card security and fraud prevention [11]. Pattern recognition can be thought of as a subset of signature verification. Signature verification, like any other pattern recognition problem, can be solved by extracting distinctive features from a set of original signatures. These characteristics can take the form of temporal functions or global parameters [12]. In signature verification systems, a number of signature samples are used to first enroll the user. When a user creates a new signature, the signature is first compared against the reference signatures for that person. Certain threshold values are used to determine the dissimilarity between the two signatures; if the value is less than this value, the user is authenticated; otherwise, the user is rejected [8,9].

To determine whether a signature is real or forged, there are two methods [8].

(i) **Offline Approach:** When we talk about offline verification, we're talking about signatures that were written on paper and scanned. When compared to the online method, the offline method is less precise.

(ii) **Online Approach:** We use a digitizing surface to record dynamic data such as pressure, speed, and direction, resulting in improved accuracies.

3. Handwritten Signatures Classification [8]

There are three types of forgeries involving handwritten signatures.

A. Skilled Forgery: This forgery is created by a professional forger who has been trained to forge other people's signatures for a long period. The detection of them is extremely difficult and difficult.

B. Casual Forgery: In this sort of forgery, the signer intently examines the signatures of others for a short period of time before copying them in his own way without any practise.



C. Random Forgery: The signer or forger creates a forgery known as simple forgery or random forgery [10] by using the victim's name in his own style.

II. LITERATURE SURVEY

Mukta Rao et al. [1] used Hopfield Neural Networks to build a new automatic technique for verifying legitimate signatures in bank checks. Some academics have used HNN to construct pattern recognition algorithms; we have expanded on their work to include signature verification. This work adds to the development of an automated technique for valid signature verification on bank checks. The developed energy function provides for a trade-off between its neighborhood's influence and its own criterion. This gadget can recall and complete inputs that have been partially provided. A storage prescription is used to train the network, forcing stable states to match to (local) minima of a network's "energy" function. Dhandapani, S, and Ashok Kumar D. [2] offer a signature verification model that combines Zernike moments, circularity, and aspect ratio. The shape of a signature can be used to identify it. Moments are useful shape descriptors because they are both translational and scale invariant. The amplitude and phase of Zernike moments, as well as the signature's circularity and aspect ratio, are extracted and aggregated for verification and given to the Feed forward Backpropagation Neural Network. The signature is classified as authentic or forged by this Neural Network. The average accuracy is 95.83 percent when these feature vectors are combined.

The suggested approach by Mohammed Abrar Ahmed et al. [3] focuses on a method that uses an artificial neural network to validate the signature of a bank cheque. Several image processing algorithms are used to validate signatures depending on parameters derived from the signature. For detecting and verifying, this research employs an artificial neural network based on a well-known backpropagation technique. The false reject rate, false-positive frequency, and EER (equal error rate) are all used to evaluate system performance. The goal of this assignment is to limit the computer's inherent qualities in order to ensure that the signature is genuine or not, as well as to add a label denoting the signature's size so that the employee verifying the signature can participate in the decision-making process. To recognize the signature, Shubhangi L. Karanjkar and P. N. Vasambekar [4] employed an Artificial Neural Network (ANN) technique. By cropping the region of interest, a signature is obtained from the bank check in this approach. It is also trained and saved in a trained database. After that, the signatures to be checked are compared to the signatures in the test database. The metrics needed to recognize the signature are the area, centroid, skewness, standard deviation, and mean of the signature images. The experimental results show that the feed forward back propagation network method required fewer neurons, had higher precision, and required less reckoning time.

A Bank Cheque Signature Verification System based on FFBP Neural Network Architecture and Feature Extraction based on GLCM is presented by Ashok Kumar. D and Dhandapani.S [5]. The Offline Bank Cheque Signature Verification System uses a Neural Network model for signature verification and testing. The signature obtained from the bank check is preprocessed, and the signature's Gray Level Co-occurrence Matrix (GLCM) features are extracted. A Feed Forward Back Propagation Neural Network is trained using the extracted features (FFBPNN). To determine if a signature is real or counterfeit, the signature attributes are fed into a trained neural network. A total of 120 authentic and counterfeit signatures are used to test the system. The method has 92.08% accuracy, a sensitivity of 93.25%, and a specificity of 91.12%. The authors of BramaraNeelima K and S Arulselvi [6] describe a three-layer signature verification technique that is both writer independent and offline. The signature photos are analyzed for graph metrical and FAST features, which are then fed into the classification algorithms. To avoid fraudulent transactions, the suggested signature verification model combines three classification algorithms: artificial neural networks, Gaussian mixture models, and picture matching models. The proposed approach has 99% overall performance accuracy.

Javed Ahmed Mahar et al. [7] proposed a mechanism for automating offline signature verification for bank checks, even when the background color is different. The purpose of the work presented in this paper is to determine whether an input signature on a colored bank check is authentic or counterfeit. The collected signature samples (white background) are compared to the input signatures to complete this operation (colored background). The Signature Verification of Colored Cheques (SVCC) system is discussed and provided for authenticating signatures with variable background colors in spite of white paper specimens by varying color intensity. For the purposes stated above, the



SVCC system has been discussed and presented. The performance of feature extraction approaches was compared and applied using simple features, as well as the K-NN classifier. The test accuracies obtained by using the grid feature approach were 92.7 percent, the test accuracies obtained by using the global feature method were 89.8%, and the test accuracies obtained by using the texture feature method were 96.9%. Ravinder Kumar and Poonam Singhhal [8] offer an off-line signature verification and identification system that makes use of signatures' global, directional, and grid properties. The signatures were verified and classified using the support vector machine (SVM). These traits are used to train artificial neural networks. The system makes use of distinctive properties including centroid, height width ratio, total area, first and second order derivatives, quadrant areas, and so on. After signature verification, angle features are used in a fuzzy logic based system for forgery detection, and performance improves by about 80% when utilizing SVM as a classifier.

III. CONCLUSION

Signatures are the most widely accepted type of biometric identification verification in today's world. Signature verification is a frequently used and highly accepted method of verifying an individual's identity. Automatic signature verification is a burgeoning field of research with numerous practical applications. In recent years, new techniques for signature verification from Bank Cheques or documents have been developed.

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