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Signature Verification of Bank Cheque

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ABSTRACT: Signatures are the most widely accepted type of biometric identification verification in today's world. Signature verification is a frequently used and acknowledged method of verifying an individual's identity. Offline bank Cheque signature verification has been the subject of extensive investigation. In the area of security technology, signature recognition systems have recently grown in popularity. A person's handwritten signature is likewise unique, and it is used and accepted for human identity, particularly in banking and other financial transactions. In recent years, many signature verification methods such as the Hopfield neural network (HNN), Back-propagation algorithm, Support vector machine (SVM), Hidden Markov Model (HMM), and others have been utilized. In this paper, we use an Artificial Neural Network (ANN) to verify and validate signatures.

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

I. INTRODUCTION

Signatures are the most extensively used biometric identification verification method in today's world. Signature verification is a frequently used and highly acknowledged method of verifying a person's identity. Offline bank cheque signature verification has been thoroughly researched. In the field of security technology, signature recognition systems have recently gained popularity. An individual's handwritten signature is likewise unique, and it is used and accepted for human identification, particularly in banking and other financial transactions. In authorized papers, signatures provide a secure method of verification and authorization. Due to the widespread use of the internet in our daily lives and the growing demand for personal verification in many everyday applications, signature verification systems for authorization and authentication have become extremely vital in every sector. [1].

One of the most prevalent behavioral biometrics for personal identification and verification is handwritten signatures. Despite the arrival of new technologies, handwritten signatures are still employed as a form of communication in everyday life, such as in official agreements, financial systems, government use, marketing papers, or paintings. As a behavioral biometric, the signature is essentially dependent on the signer's changing activity pattern and the signing procedure. [2].

II. RELATED WORK

Security is extremely crucial in today's world. Authentication is an important aspect of security since it allows a person to be granted particular access based on his identification. There are numerous methods for authentication, and one of them is signature [3]. Several researchers developed a signature verification and validation method in the last year.

MuktaRao et al. [4] used Hopfield Neural Networks to build a new automatic technique for verifying authentic signatures in bank Cheques. Despite the fact that all signatures were real and drawn by the same individual who provided the learning sample, the algorithm rejected 18% of signature samples. Similarly, the suggested approach is incapable of discarding 11% of fake signatures. As a result, this is the proposed system's flaw, which can be improved. By integrating Zernike moments with circularity and aspect ratio, Ashok Kumar. D and Dhandapani [5] present a signature verification model. Signatures, unlike characters, differ each time due to their behavioral biometric feature. The shape of a signature can be used to identify it. The results of the experiments show that combining Zernike moments with the two geometrical features stated above gives better accuracy than utilizing them separately. The average accuracy is 95.83 percent when these feature vectors are combined.

A three-layer signature verification system is proposed by BramaraNeelima K and S Arulselvi [7], which is writer independent and offline signature verification system. The signature photos are analysed 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 a 99 percent overall performance accuracy.



Javed Ahmed Mahar et al. [8] offer a mechanism for automating offline signature verification for bank cheques, even when the backdrop colors are different. The Signature Verification of Colored Cheques (SVCC) system is studied and provided, which verifies signatures with varied backdrop colors in spite of damaged specimens by varying color intensity. For the aforementioned reason, the SVCC system has been discussed and presented. To confirm the performance of feature extraction methods, simple features were compared and implemented; the KNN classifier was also used. 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%.

The Neural Network model presented by Ashok Kumar. D and Dhandapani [6] is developed for signature verification and testing utilising the Offline Bank Cheque Signature Verification System. 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. The system is tested using 120 real signatures and 120 fraudulent signatures. The method has 92.08 percent accuracy, a sensitivity of 93.25 percent, and a specificity of 91.12 percent. In the future, the modeled system can be enhanced by reducing the number of input samples used to train the network.

III. METHODOLOGY

A systematic, theoretical analysis of the procedures used in a field of study, or a theoretical analysis of the body of methods and principles linked with a branch of knowledge, is known as methodology. It contains several steps, which are as follows (as illustrated in Figure 1):

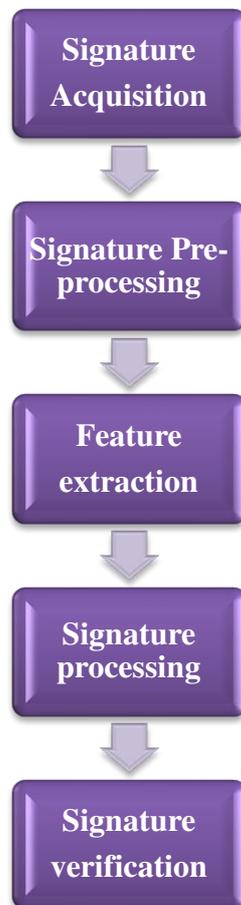


Figure 1 Signature Verification Systems



- **Signature Acquisition**

The capture of signature images is a critical element in any recognition system. The problem becomes more complicated due to the resolution, skew, and isolated components of signature.

- **Signature Pre-processing**

The noise and superfluous areas were removed from the segmented signature image. For further processing, the signature image's size is normalized. To remove the noise and complex background from the signature image, 3x3 median filters are used. For full connectivity of the signature component, morphological dilation is used to the noise-free signature image. After that, skeletonization is used to obtain the signature's skeleton structure.

- **Feature Extraction**

Similar traits are referred to as features, and extraction refers to accurately retrieving such features. The recognition ratio can be improved with adequate feature extraction. It is crucial in the construction of a strong system because all subsequent phases are dependent on these properties. This phase can be based on the following characteristics: There are three types of features: global, local, and transition.

- **Signature Processing**

In the signature processing following steps are performed:

- 1) **Area analysis:** The area is designed to move from left to right horizontally. The approximation or width with a specified amount of pixels is used to examine the region. Within the current area, the pixel density is determined.
- 2) **Cropping:** It is applied to the check's defined approximation area. Its goal is to draw a rectangular box around an object of interest and delete anything that isn't in it. If the signature is the subject of the check, this might be done quickly. Up, right, bottom, and left are the four directions in which the crop system works.
- 3) **Preprocessing:** Binarization is a critical step in the processing of bank checks. The primary goal is to create a modified image with improved quality. Preprocessing employs a variety of filters to eliminate various sorts of noise from an image.

- **Signature Verification**

The legitimacy of a paper cheque necessitates the verification of the hand-printed signature on the check. Because it is difficult to identify authentic signatures from sophisticated forgeries based on eye inspection, automatic signature verification is required. Contracts, identity cards, formal agreements, administrative forms, acknowledgements, and other documents can all be authenticated using these procedures.

IV. RESULT

The initial method is to scan the cheque from which the signature is recovered and use various noise-reduction techniques. The system determines the approximate area of interest based on past information about the material. The segmented signature image is then preprocessed to remove noise and unwanted areas in the second phase. For further processing, the signature image's size is normalized. To remove the noise and complex background from the signature image, 3x3 median filters are used. For full connectivity of the signature component, morphological dilation is used to the noise-free signature image. After that, skeletonization is used to obtain the signature's skeleton structure. Signatures are made up of a variety of little parts, such as dots, symbols, and distinctive marks that describe a person's behavioral traits.

Feature Extraction is the third phase. It refers to features that are comparable, and Extraction refers to accurately retrieving such features. The recognition ratio can be improved with adequate feature extraction. It is crucial in the construction of a strong system because all subsequent phases are dependent on these properties. The fourth phase includes area analysis, cropping, and preprocessing.

Finally, signature verification is required since the hand-printed signature on a paper cheque verifies the authenticity of the cheque. Because it is difficult to identify authentic signatures from sophisticated forgeries based on eye inspection, automatic signature verification is required. Contracts, identity cards, formal agreements, administrative forms, acknowledgements, and other documents can all be authenticated using these procedures. As a result, static (off-line) signature verification has attracted an increasing number of researchers. In the recent past, various strategies for offline verification of signatures have been presented. Figure 4.1 shows the home screen of the system. And figure 4.2 shows the actual output of the system.



Figure 2 Home screen of the system



Figure 3 the actual output of the system

V. CONCLUSION

In today's world, signatures are the most frequently accepted form of biometric identification verification. Signature verification is a popular and well acknowledged way of confirming a person's identification. The suggested system focuses on an artificial neural network-based method for validating the signature on a bank cheque. Several image processing algorithms are used to validate signatures depending on parameters derived from the signature. Signature verification is possible with this proposal mechanism. It will assist you in locating a certain individual and provide more complete information on signature authentication for the above implementation. This system recognizes and verifies an individual's signature using a neural network.



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