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Offline Signature Verification

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ABSTRACT

Now a day's signature is becomes a most important biometric authentication technique. In banks or at the other necessary documents, signature plays an important role to authenticate the person. In this technique, we are going to present a deep learning approach for offline signature verification to prevent the fraud signatures by fake peoples. We are going to do deep learning with the help of Convolution Neural Network (CNN). In this study, we are going to collect dataset of different signatures from the different angles. Signature is taken as an input in the form of image. For recognizing the signature, we first do some geometrical and statistical calculation aiming to extract special features from the signatures then we train an artificial neural network on these features from different signers. Finally, the extracted features from the tested signature are compared with the previously trained features and we know the signer.

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I. INTRODUCTION

Traditional bank checks, bank credits, credit cards and various legal documents are an integral part of the modern economy. They are one of the primary mediums by which individuals and organizations transfer money and pay bills. Even today all these transactions especially financial require our signatures to be authenticated. The inevitable side-effect of signatures is that they can be exploited for the purpose of feigning a document's authenticity. Hence the need for research in efficient automated solutions for signature recognition and verification has increased in recent years to avoid being vulnerable to fraud.

Signature verification can be considered a special case of pattern recognition. Like in any pattern recognition problem, in signature verification distinctive features can be extracted from a set of original signatures. However, Approaches to signature verification fall into two categories: On-line and Off-line. There are two types of signatures, offline (static) and online (dynamic). Online signatures have higher distinctive features but offline signatures have fewer distinctive features. So offline signatures are more difficult to verify. In addition, the most important drawback of offline signatures is that they cannot be signed with the same way even by the most talented Signer.

Offline signatures, which legally impose financial and moral liabilities, are an authentication technique that is still widely used today especially in legal documents, banking and commercial transactions. Hence, offline signatures are frequently misused by malicious people and used for fraud. To prevent fraud and malicious intentions signature verification is used. With the development of machine learning, new algorithms present promising solutions that can be used for signature verification. For these reasons, signature verification is one of the most important problems remains to be solved in machine learning methods nowadays. The most important drawback of offline signatures is that they cannot be reproduced in the same way.

In this study we will take the dataset of the different signatures. We will take signature as an input in the form of image. After taking signature as an input next step is feature extraction. Signature is separated according to the features. After extracting the features, matching process is done. According to the matching result is implemented. And final output is recognition of signature.

Main motivation of the system is to provide security to the signatures which are widely used in legal documents, banking and commercial transactions. Normally it is difficult to identify the signature of the particular user at the time of verification of the documents. At that time, there is a

need to identify the fake signatures from the documents. So there must be some system or application which would help banking system and some other systems like commercial transaction to detect the fake signature. There are many devices in market are available for signature check up, But there are many limitations regarding their maintenance due to their heavy cost, size of instruments. This system is also helpful to provide more security at the time of all transactions and also at the time some property issues.

Many of the systems were introduced in the developed countries where the infrastructure is working perfectly. In most cases, the systems are adapted to work in developing countries. To reduce some of these problems there is need to approach the remote detection from a ground-up approach to suit the basic minimal conditions presently available in developing countries.

A simple signature verification system design can be approached by the number of parameters it can detect. In some instances, by verifying one parameter several readings can be calculated.

As we know that, the population of country is growing day-by-day and fraud issues are becoming one of the major factors that lead to spend lot of expenditure. To verify the signatures of user on regular basis is getting harder. So, using this system we are trying to provide security by using offline signature verification technique. One major advantage is in reduction of expenditure and frauds. Bank system can find out fraud signatures after verifying signatures. By using a trending technology, we can verify signatures offline.

II. LITERATURE SURVEY

Elias N. Zois , Dimitrios Tsourounis , Ilias Theodorakopoulos , Anastasios L. Kesidis, and George Economou, in this paper, a feature extraction method for offline signature verification is presented that harnesses the power of sparse representation (SR) in order to deliver state-of-the-art verification performance in several signature datasets like CEDAR, MCYT-75, GPDS, and UTSIG. Beyond the accuracy improvements, several major parameters associated with SR; such as selected configuration, dictionary size, sparsity level, and positivity priors are investigated. Besides, it is evinced that second-order statistics of the sparse codes is a powerful pooling function for the formation of the global signature descriptor. Also, a thorough evaluation of the effects of preprocessing is introduced by an automated algorithm in order to select the optimum thinning level. Finally, a segmentation strategy which employs a special form of spatial pyramid tailored to the problem of SR is presented along with the enhancing of the produced descriptor on meaningful areas of the signature as emerged from the binary robust invariant scalable key-point detection mechanism.

Victor L. F. Souza, Adriano L. I. Oliveira, Robert Sabourin, in this work it is investigated whether the use of these CNN features provide good results in a writer-independent (WI) HSV context, based on the dichotomy transformation combined with the use of an SVM writer-independent classifier. The experiments performed in the Brazilian and GPDS datasets show that (i) the proposed approach outperformed other WI-HSV methods from the literature, (ii) in the global threshold scenario, the proposed approach was able to outperform the writer-dependent method with CNN features in the Brazilian dataset, (iii) in an user threshold scenario, the results are similar to those obtained by the writer-dependent method with CNN features.

Muhammed Mutlu Yapıcı, Adem Tekerek, Nurettin Topaloglu, in this study, we proposed a Deep Learning (DL) based offline signature verification method to prevent signature fraud by malicious people. The DL method used in the study is the Convolution Neural Network (CNN). CNN was designed and trained separately for two different models such one Writer Dependent (WD) and the other Writer Independent (WI). The experimental results showed that WI has 62.5% of success and WD has 75% of success. It is predicted that the success of the obtained results will increase if the CNN method is supported by adding extra feature extraction methods.

Elias N. Zois, Ilias Theodorakopoulos, Dimitrios Tsourounis, in this work, sparse dictionary learning and coding are for the first time employed as a means to provide a feature space for offline signature verification, which intuitively adapts to a small set of randomly selected genuine reference samples, thus making it attractable for forensic cases. In this context, the K-SVD dictionary learning algorithm is employed in order to create a writer oriented lexicon. For any signature sample, sparse representation with the use of the writer's lexicon and the Orthogonal Matching Pursuit algorithm generates a weight matrix; features are then extracted by applying simple average pooling to the generated sparse codes. The performance of the proposed scheme is demonstrated using the popular CEDAR, MCYT75 and GPDS300 signature datasets, delivering state of the art results.

Wang Kai, Liu Jingzhi, Xu Shun, Wang kai, Gan Zhichun, In this paper, we study a fast and computationally efficient sparse representation classification scheme for battlefield textual information in which the block sparsity of sparse coefficients is exploited. A novel sparse approximation algorithm tailored for this low complexity classification method is proposed. Experiment results show that our classification algorithm that leverages the sparse structure of the textual information outperforms plain sparse representation classification procedures in both classification accuracy and computationally efficiency.

A. Hamadene and Y. Chibani, In this paper, we propose a one-class writer-independent system using feature dissimilarity measures (FDM) thresholding for classification and a reduced number of references. The proposed system involves the use of Contourlet Transform (CT) based directional code co-occurrence matrix (DCCM) feature generation method. The verification is achieved through a WI threshold which is automatically selected using a new signature stability criterion. The proposed writer independent concept is besides addressed through the mixture of different writers' datasets in both design and verification stages. Experimental results show the effectiveness of the proposed system in spite of the strict verification protocol using the one class concept, a unique threshold for accepting or rejecting a questioned signature, the reduced number of writers and the limited number of reference signatures.

Shih-Chung, Hsu, Chung-Lin, Huang, This paper proposes an object verification method in two different views by using sparse representation. The proposed method contains three major modules. First, we train the sparse matrix by using K-Singular Valued Decomposition (K-SVD) and the maximum correlation training sample selection. Second, we project the training samples onto the sparse matrix to obtain the parse vector training set. Third, we combine two training sets of the same/different objects from two different views to generate positive/negative hybrid sparse vector sets for SVM classifier training. Our contributions in this paper are (1) proposing a better dictionary representation learning than original K-SVD learning, and (2) developing an optimal sparse representation for object verification with very good accuracy. In the experiment, we show that our method has the better accuracy than the other methods.

Mrs. Madhuri R.Deore, Mrs. Shubhangi M. Handore, The signature identification can be offline or online. We used the image processing technique for offline signature identification here no dynamic feature are available in offline identification. A brief survey on various off-line signature recognition & verification schemes is represented this paper.

Amit Kishore Shukla, Pulkit Mohan, Gaurav Ojha, Manoj Wariya, The objective of this paper is to process the hand written signature and verify it. For verifying the signatures of a particular person, we have taken n samples of Genuine Signature, signed by that person on a piece of paper. Further we scanned the paper containing the set of signatures. Now we have extracted each of the genuine signatures of the person and stored it in separate file of the format .bmp. The extraction of the signatures in the last step has been in minimum area to provide accurate area of the signing of signature. We could have matched the signature of each person with the other signature but usually it is almost impossible to produce exactly the same set of signatures. We would verify the signatures on the following parameters allowing a percentage of error in it. Permissible boundary, Hand pressure, Euclidian distance, Center of cylinder generated from minimum spanning tree, Delaunay triangulation of the signature, Angle between base line and center of gravity.

Unnila A. Jain, Prof. Nitin N. Patil, This paper presents current approaches to off-line signature verification with the goal of surveying the most beneficial techniques that are available. This investigation will also introduce techniques that will significantly boost the achieved classification accuracy rate. This paper presents a comparative study of various approaches of offline signature verification too.

H. Firouzi, M. Babaie-Zadeh□, A. Ghasemian Sahebi, C. Jutten, In this paper an extension of the sparse decomposition problem is considered and an algorithm for solving it is presented. In this extension, it is known that one of the shifted versions of a signal has a sparse representation on an over complete dictionary, and we are looking for the sparsest representation among the representations of all the shifted versions of □. Then, the proposed algorithm finds simultaneously the amount of the required shift, and the sparse representation. Experimental results emphasize on the performance of our algorithm.

III. SYSTEM ARCHITECTURE

In the diagram, there is flow of our project.

1. The whole architecture is made by PYQT4 used in python language. PYQT4 give all the necessary stuff related to GUI design. PYQT4 provides us display screen, buttons and so on. So, in this way Net bean helps us in design GUI.
2. After designing of GUI, another task is to authenticate valid user for operating application. To deal with this task, we are using MySQL database to store data of username and password and through this, user can authenticate easily.

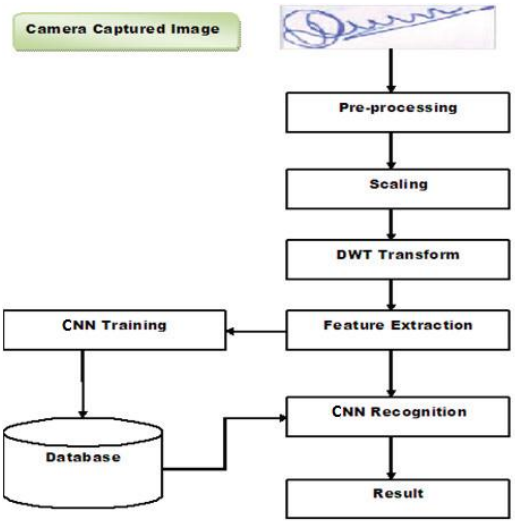

Figure No. 3.1 system Architecture

3. Another task is to preprocess the input image which can be done by OpenCV library of python. By using this library, image is converted into grayscale image, contour image and smoothen image.
4. The major task of this survey paper is to collect datasets of signature image and to achieve this result, we are working on different signature images, Land Sat 7 images.
5. After this process we will apply CNN on the particular input image to get accurate result of verification of offline image.

In this way, we will achieve our all the tasks to achieve our project goal.

IV. PROPOSED WORK

The proposed system is designed to help these organizations, which are depending on the signatures to complete the documentation and transactions. The basic ideology is integrating the principle of CNN with the input

signature image to verify and identify accurate result of signatures.

To overcome the problems faced in existing system we are going to implement our system. In this system we are going to use CNN algorithm to get correct output. In this system we are going to minimize the human interpretation error. By using this system, it should be easy to find out the frauds and duplicates signature easily.

V. CONCLUSION

Neural networks have demonstrated their success in many applications due to their ability to solve some problems with relative ease of use and the model-free property they enjoy. One of the main features, which can be attributed to CNN, is its ability to learn nonlinear problem offline with selective training, which can lead to sufficiently accurate response.

Application of Convolution Neural Network (CNN) to the above mentioned problem has attained increasing importance mainly due to the efficiency of present day computers. In addition, the times of simulation and testing in the CNN application are minimal. And the verification system based on CNN is able to learn different kinds of signature datasets, by using only geometrical offline features.

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