Enhanced Approach For Handwritten Text Recognition Using Neural Network

Aman Puri 1, Kamlesh Lakhwani 2

Suresh Gyan Vihar University, Jaipur

Abstract

The off-line character recognition is a process which is used to recognition the pattern. The problem for recognition is to segment the character into isolated word. In this paper, we use a new method which calculates the approximation width of the word for the segmentation. After using this algorithm characters are segmented which may have some extra stokes, braked image. To remove these errors some pre-processing steps are performed to make the character smoother. A new feature extraction algorithm is applied to this segmented character, in this algorithm we used to calculate the pixels range and also exact value of a image. The range value is used for the classification. The classifier has been used to train the neural network. Recognition of a character image we used to calculate the approximation value of this image and the value of this image has tested on the trained neural networks, which shows the recognized character. This system is developed by using JAVA. This system converts the handwritten document into structural text form.

Keyword: - Segmentation, Neural Network, Pixels calculation, Feature extraction, Java

1. Introduction

In today's fast changing and emerging fields of computer science, one of the major research sector that still have a great work to be done is handwritten text recognition. Since, computer plays an important role in various small and large scale industries for automation, various departments in today's mode of computerization uses handwritten text conversion mechanisms. Some of the obvious application that contains the auto indexing and processing of archived documents, self introducing forms, envelopes, hand written notes, ancients hand written text requires the use of handwritten text recognition techniques.

Off-line character recognition is a mechanism of text recognition in which texts or characters are recognized from the handwritten papers, messages. In this format the recognition is done after sometime the text was written. In order to perform the offline handwritten text recognition, the text is went through various algorithms and mechanisms. The input text is recognized by the recognition engine in the form of binary image or grayscale image.

The main approached used for offline handwritten character recognition is mainly classified into two forms:

    (1) SEGMENTATION BASED
    (2) HOLISTIC BASED

The holistic based works on a small vocabulary or collection of small set of characters in this mechanism of offline character recognition the global features are extracted from the entire word is considered. The mechanism of holistic method becomes more complex as the set of characters increases in the vocabulary, because it requires more space and more complex pattern recognition.

The segmentation based approach on the other hand is an incremental approach which basically works on the bottom-up approach, in this mechanism of text recognition the starting if done from single stroke or character towards a meaning full text representation. By the segmentation mechanism the problem is reduced to the identification of simple characters or strokes and this can be handled by unlimited vocabulary.

The process of optical character recognition of any font or script can be broadly broken down into following stages:
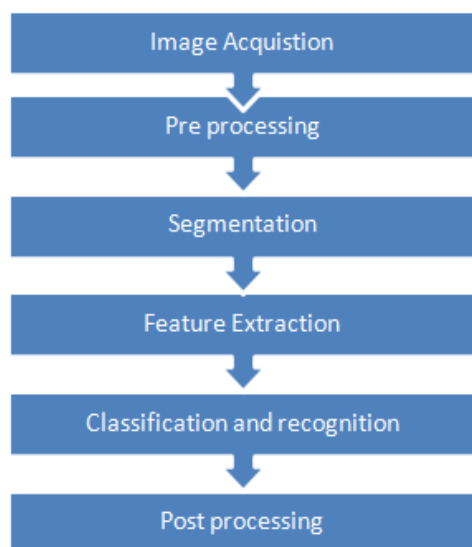
Figure 1 Stages for optical character recognition

My work is divided into five sections. First section gives the introduction about off-line character recognition. The II section is used to describe the methods that are used for character recognition, in this section: pre-processing operation is used, in which binarization, noise reduction etc operations are performed. It also describes the new method: segmentation and feature extraction. On the basis of the feature, classification of character has been done. Then neural network is trained and tested different kind of sample data for the recognition. The III section is used for results and discussion and last section which describe the conclusion.

2. Task Involved

This is section is divided into six parts:- Image Acquisition Pre-processing, segmentation, feature extraction, classification and recognition. In Image Acquisition method of text recognition the image is captured from any scanned devices as an input image. The image captured must be in some specific image format like JPEG, PNG. The image can be captured by and digital device like OMR (scanner) or digital camera etc.

Pre-processing: This process after image is acquired is most important, because under this stage of text recognition various stages works together to recognize the image. The gray scale conversion is performed on the acquired image and then edge detection task is performed by using Canny algorithm in java. For Example:-
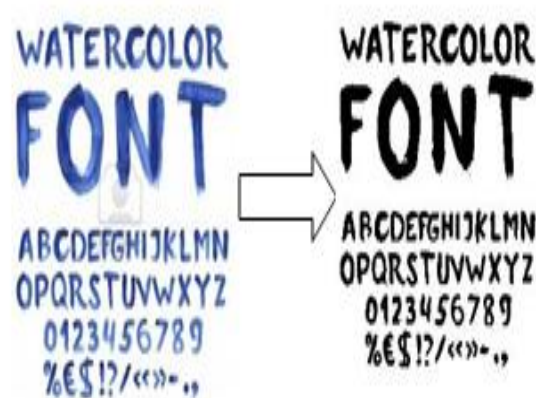

Figure 2 :- Gray scale conversion
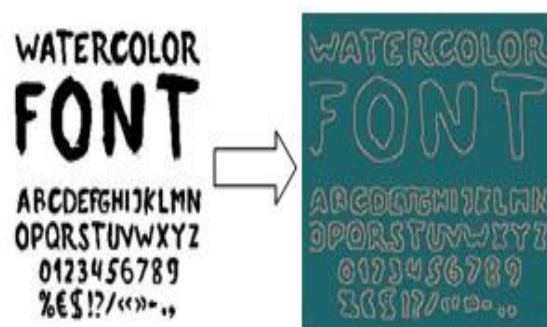
Figure 3:- Gray Scale to Edge Detection

Segmentation: In the segmentation stage, an image of sequence of characters is decomposed into sub-images of individual character. We used a new approach called as approximation width calculations of character. In this algorithm we calculated the approximate width of a single character by getting width of a character we segment the characters into single character. For Example:-
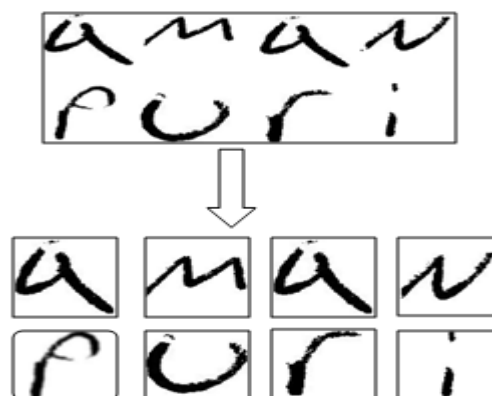
Figure 4:- After Segmentation

Feature Extraction and classification: The feature extraction step selects and prepares data which is used by a classifier to achieve the recognition task. Feature extraction involves representing a handwriting text by a set of discriminative features. Here we use a new tactics of feature extraction that is based on the image pixels range and calculated exact value. Here are the following steps to perform this:

Total numbers of pixels occupied by image that will be equals to 72 X 72.

To find total number on (true) pixels that is 1.

Now, we get the used pixels

Since every character from a-z used by the users have some common characteristics, therefore we calculated the average intensity of every alphabets pixels.

After calculating the intensity, this intensity tested with trained neural network.
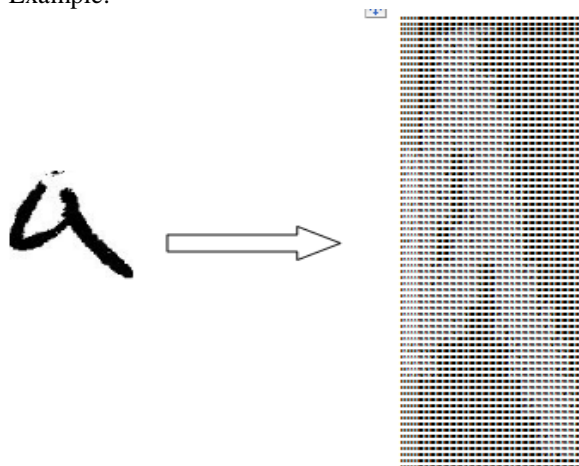
For Example:-

Figure 5: Converting into pixels

Now we get these values:-

Total number of pixels in the image is 5625.

Number of pixels "on" in image is 2317.

Range of pixels image is 2 and exact pixels value is 2.4277082434.

Now on the basis of these values all the alphabets are classified. Like: - for alphabet a: the range of pixels is 2 and exact pixels value is 2.4277082434. So if the value of scanned image pixels is 2 then the alphabet is a.

Recognition of alphabets: It is decision making part of recognition system. The performance of classification and text recognition decides the quality of the features. Here we use neural network to train the image. The neural network is trained by classified pixels range. When new image is scanned then the approximation value of pixels is calculated and this value is compared with trained neural network. For testing purpose we use 30 different handwritten characters and found the good recognition rate. For Example:-
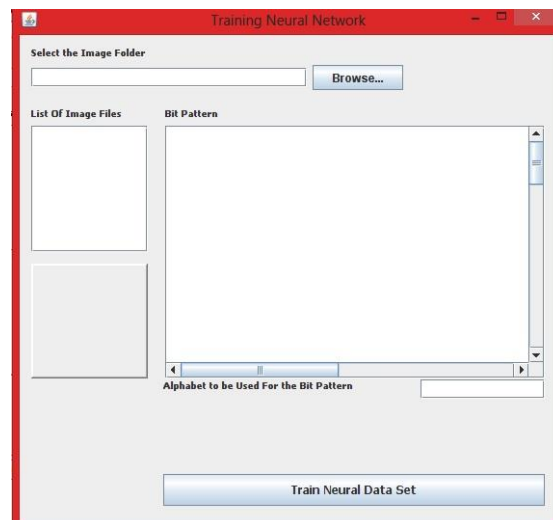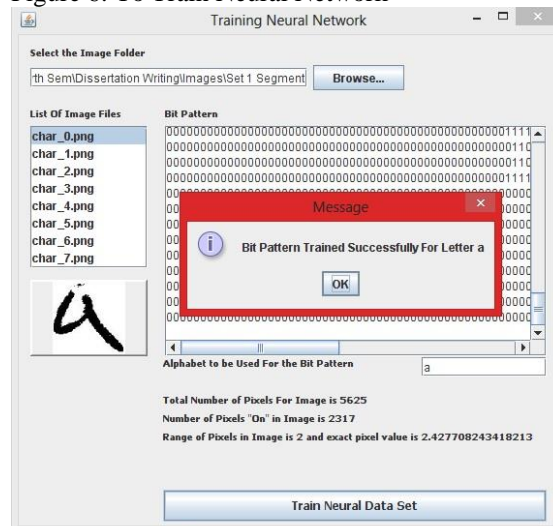

Figure 6: To Train Neural Network

Figure 7: Trained Neural Network

3. Results & Discussion

In order to test the correctness of the individual modules of the tactics discussed here, various kind of handwritten samples were gathered from different people and segmentation was conceded after which feature extraction of character were carried out by using binary form and then neural network was trained and a variety of characters were focused to neural networks after that pixels range algorithm to see how on form the process of recognition is bring out for the variety of dissimilar handwritten scanned input characters.

The testing phase was performing to confirm the effectiveness of recognition and the recognition rates of the individual neural network. Once the bit pattern is generated and then pixels value, "on" pixels values, average pixels values and exact pixels value were calculated, then neural network is ready for training. The neural network can be trained for pixels range, exact value of pixels and average pixels values. The training of neural network requires the proper behaviour of network on the X input and on Y output.
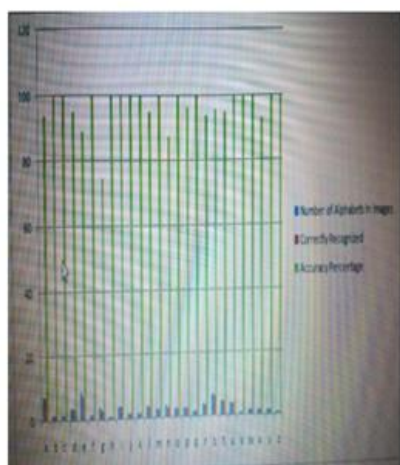
Figure   Graph obtained for testing of artificial neural network

The algorithms that have been used for segmentation of handwritten characters, neural network and binary form of image were implemented and trained with the help of 208 handwritten character models, 8 models per letter on JDK 1.7.0 and tested individually. These algorithms after extensive testing have offered us with extremely well-organized handwriting recognition by the help of which a human handwritten text can be transferred into an editable format on a computer. This was providing the facility to the user to edit the text. These algorithms tested on 208 handwritten models which providing 98.28% recognition rate that increases the efficiency of the recognition.

4. Conclusion

The paper has shown a novel tactics of recognition of handwriting using a distinctive and healthy combination of neural network and binary form algorithms. On programming and testing the sections an awfully elevated efficiency has been noted. The handwritten recognition of an image is a very tedious task which can be easily completed by the help of the algorithms that are described here and these algorithms providing us a very high efficiency of the accuracy of the segmentation as well as the character recognition with the of binary form algorithm and neural network. The idea here has concentrated handwriting recognition entirely with image processing in java after the application of both neural networks and binary form algorithms.

5. References

[1] Azizah Suliman, Mohd. Nasir Sulaiman, Mohamed Othman, Rahmita Wirza, *"Chain Coding and Pre Processing Stages of Handwritten Character Image File,"* Electronic Journal of Computer Science and Information Technology (eJCSIT), Vol. 2, No. 1, 2010.

[2] Hendrik Pesch, Mahdi Hamdani, Jens Forster and Hermann Ney, *"Analysis of Preprocessing Techniques for Latin Handwriting Recognition,"* 2012 International Conference on Frontiers in Handwriting Recognition.

[3] M. Blumenstein and B. Verma, *"A New Segmentation Algorithm for Handwritten Word Recognition".*

[4] Kaustubh Bhattacharyya and Kandarpa Kumar Sarma, *"ANN-based Innovative Segmentation Method for Handwritten text in Assamese,"* IJCSI International Journal of Computer Science Issues, Vol. 5, 2009

[5] G. Louloudis, B. Gatos, I. Pratikakis, C. Halatsis *"Line And Word Segmentation of Handwritten Documents,"* International Conference on Frontiers in Handwriting Recognition (ICFHR) 2008

[6] Vandita Singh, Bhupendra Kumar, Tushar Patnaik, *"Feature Extraction Techniques for Handwritten Text in Various Scripts: a Survey,"* International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-1, March 2013

[7] J.Pradeep, E.Srinivasan and S.Himavathi, *" Diagonal Based Feature Extraction For Handwritten Alphabets Recognition System Using Neural Network, "* International Journal of Computer Science & Information Technology (IJCSIT), Vol 3, No 1, Feb 2011

[8] Sandeep Saha, Sayam Kumar Das, Nabarag Paul, Sandip Kundu, *" Optical Character Recognition using 40-point Feature Extraction and Artificial Neural Network,"* International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 4, April 2013.

[9] Jason J. S. Chang and Shun-Der Chen, *" The Postprocessing of Optical Character Recognition based on Statistical Noisy channel and language model".*

[10] John F. Pitrelli and Michael P. Perrone, *"Confidence-Scoring Post-Processing for Off-Line Handwritten-Character Recognition Verification,"* Proceedings of the Seventh International Conference on Document Analysis and Recognition (ICDAR 2003) 2003 IEEE

[11] Dayashankar Singh, Sanjay Kr. Singh, Dr. (Mrs.) Maitreyee Dutta, *" Hand Written Character Recognition Using Twelve Directional Feature Input and Neural Network,"* 2010 International Journal of Computer Volume 1 – No. 3