Character Recognition Using Neural Network

Ankit Sharma[#1],Dipti R Chaudhary[#2]
[#]Instrumentation & Control department[#1, #]Instrumentation & Control department[#2,
[#1]Nirma University , [#2]Nirma University
[#1]Ahemedabad, India , [# 2]Ahemedabad, India

***Abstract*- In the present paper, we are use the neural network to recognize the character. In this paper it is developed 0ff-line strategies for the isolated handwritten English character (A TO Z) and (0 to 9) .This method improves the character recognition method. Preprocessing of the Character is used binarization, thresolding and segmentation method .The proposed method is based on the use of feed forward back propagation method to classify the characters. The ANN is trained using the Back Propagation algorithm. In the proposed system, English nue-merical letter is represented by binary numbers that are used as input then they are fed to an ANN. Neural network followed by the Back Propagation Algorithm which compromises Training.**

***Index Terms*—Neural network, back propagation method Segmentation, image processing toolbox ,matlab .**

I.INTRODUCTION

Handwriting recognition is undoubtedly one of the most challenging areas of pattern recognition. It is extremely useful in a wide range of real world practical problems, including documentation analysis, mailing address interpretation, bank check processing, signature verification, document verification and many others **[1].**Several pattern recognition approaches have been applied to both on-line and off-line handwriting recognition, including statistical methods, structural and syntactic methods, and neural networks. Some reading systems identify strokes; others **try** to identify Characters, groups of characters, or entire words **.**

Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. As in nature, the network Function is determined largely by the connections between elements. We can train a neural network to perform a particular function by adjusting the values Of the connections (weights) between elements. Commonly neural networks are adjusted, or trained, so that a particular input leads to a specific target output. Such a situation is shown below. There, the Network is adjusted, based on a comparison of the output and the target, until the network output matches the target. Typically many such input/target pairs are used, in this *supervised learning*, to train a network.

Computerized document processing has been growing rapidly since the 1980's because of the exponentially increasing amount of daily received documents and the more powerful and affordable computer systems. Intuitively, the conversion of textual blocks into ASCII codes represents one of the most important tasks in document processing [5]. Our strategy of reclassifying characters is to incorporate typographical structure analysis which categorizes characters in the first step, and therefore it reduces the scope of character Recognition.

Automatic Postal sorting, automatic bank cheque processing are application of Character recognition. In the work on character recognition has been reviewed. Optical Character Recognition (OCR) is used to recognize printed and handwritten characters. There are numerous approaches that address the problem and they vary in the features extracted from the graphical representation of the
Characters.

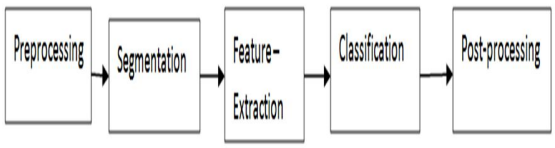


Fig. 1 Block Diagram

II.HISTORY

Early optical character recognition could be traced to activity around two issues: expanding telegraphy and creating reading devices for the blind.In 1914, Emanuel Goldberg developed a machine that read characters and converted them into standard telegraph code.Around the same time, Edmund Fournier d'Albe developed the Optophone, a handheld scanner that when moved across a printed page, produced tones that corresponded to specific

letters or characters. Goldberg continued to develop OCR technology for data entry. Later, he proposed photographing data records and then, using photocells, matching the photos against a template containing the desired identification pattern. Paul W. Handel also obtained **a** US patent on such template-matching OCR technology in USA in 1933.

In 1949 RCA engineers worked on the first primitive computer-type OCR to help blind people for the US Veterans Administration It converted the typewritten reports into punched cards for input into the computer in the magazine's subscription department, for help in processing the shipment of 15-20 million books a year. In about 1965, Reader's Digest and RCA collaborated to build an OCR Document reader designed in 1965.

Image Preprocessing:

The first phase in our character recognition process is converting the image to Binary image by thresholding the given character image. Two intensity values are available in binary image. These values are Black and White. We are use zero for Black and one for white. Thus the color of the character **is** White and the background **is** black.

Preprocessing techniques are needed on color, grey-level or binary document images containing text and/or graphics. In character recognition systems most of the applications use grey or binary images since processing color images is computationally high [5].Such images may also contain non-uniform background and/or water marks making it difficult to therefore; the desired result from preprocessing is a binary image containing text only. Thus, to achieve this, several steps are needed, first, some image enhancement techniques to remove noise or correct the contrast in the image, second, thresholding to remove the background containing any scenes, watermarks and/or noise, third, page segmentation to separate graphics from text, fourth, character segmentation to separate characters from each other and, finally, morphological processing to enhance the characters in cases where thresholding and/or other preprocessing techniques eroded parts of the characters or added pixels to them. The above techniques present few of those which may be used in character recognition systems and in some applications; few or some of these techniques or others may be used at different stages of the OCR system.

Pre-processing

Pre-processing covers all those functions of feature extraction to produce a original image. the feature extraction components of the character recognition used directly.

The steps in pre-processing involves

Size normalization: Bicubic interpolation is used for standard sized image.

Binarization: it is process of converting a gray scale image into binary image by thresholding

Smoothing: the erosion and dilation smooth the Boundaries of objects.

Edge detection: morphological gradient operators are used in edge detection because they enhance intensity of edges of characters.

Segmentation:, the characters are always written in "print fashion", not connected,horizontal histogram profile (for line segmentation), vertical histogram profile (for word segmentation) and connected component analysis are able to handle the character segmentation problem.

III.SEGMENTATION

After scanning the document, the document image is subjected to pre-processing for background noise elimination, and binarization to generate the bit map image of the text. The pre-processed image is divided into lines, words and characters. Explanation is given to the below.

Line Segmentation

Word Segmentation

Character Recognition

Line segmentation-To separate the text lines, line segmentation is used.

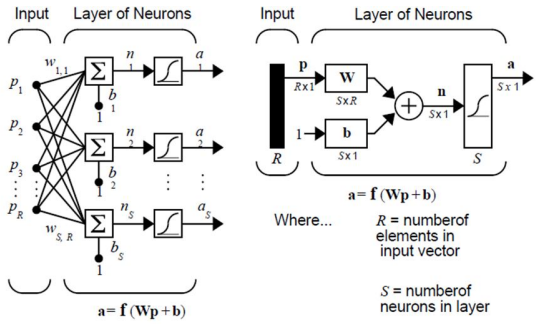
Word segmentation- Word segmentation is provide the space between words.

Character Recognition-It is providing the Spacing between the characters. so it is called segmentation

.

IV.FEED FORWARD NETWORK

A single-layer network of *S* logsig neurons having *R* inputs is shown below in full detail on the left and with a layer diagram on the right. Feed forward networks often have one or more hidden layers of sigmoid neurons followed by an output layer of linear neurons. Multiple layers of neurons with nonlinear transfer functions allow the network to learn nonlinear and linear relationships between input and output vectors. The linear output layer lets the network produce values outside the range –1 to +1.On the other hand, if you want to constrain the outputs of a network (such as between 0 and 1), then the output layer should use a sigmoid transfer function (such as logsig).



V.MODULE OF CHARACTER RECOGNITION SYSTEM

IMAGE PRE-PROCESSING

The next stage is image pre-processing module. Image pre-processing relates to the preparation of an image for later analysis and use. Images captured by a camera or a similar technique are not necessarily in a form that can be used by image analysis routines. Some may need improvement to reduce noise; other may need to simplified, enhanced, altered, segmented, filtered, etc[4]. The first step in the pre-processing block is to transform the color image into a gray scale image and this result to noisy gray scale image. In the next step, filtering is used in order to cancel the presented noise. Then, edge detection algorithm is applied for obtaining edge of the noiseless gray scale image. Image pre-processing module is consist of following operations-

(i) Gray scale image
(ii) Noise removal
(iii)Edge detection
(iv)Feature Extraction

GRAY SCALE IMAGE

In this proposed system hand image is captured through digital camera so the original image is colored image. For digital image processing it is necessary first colored hand image convert in to grayscale image.Each pixel has single sample which has intensity information. Now color image is converted in to gray scale image with noise because there is some noise present in the input colored image due to dust and atmospheric conditions. This noise removal is therefore essential for the system.

NOISE REMOVAL

The next step in image pre-processing is noise removal. It is necessary to remove the noise from the image because it may produce difference between the actual palm and captured image. This causes the variation in data base feature and measured feature and also affected the accuracy of the system. edge detection is difficult in noisy image. Noise and the edges contain high- frequency content.

Basically the noise produced in the image is due to device using for capturing image, atmosphere condition or surrounding. There are many methods to remove the noise in Matlab. In this proposed system the noise is removed by wiener2 filter. So before extracting features from the image, it is very important to remove the noise from the image. noisy images are used by operator larger in scope. So less accurate localization of the detected edges are available

color edges, gray level edges, texture edges etc. Not all edges are detected by all edge detection operators. Each operation has its specific specialty in edges and better the edge detection, usually; more complex and costly is the operation.

FEATURE EXTRACTION

The next module of character recognition is feature extraction. It is the special form of Reduction. When input algorithm is very large at that time it is reduce the data [9].If the features extracted are carefully chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input.

VI.RESULTS

The input image captured by digital camera is a colored image. Before features are extracted from an image, it may be useful to pre-process the image to reduce irrelevant information or noise and to enhance the image properties that will make feature measurement easier and reliable. There may be random noise that is generated due to different factors such as dirt, dust particles, etc. It can cause significant degradation in the feature extraction process which in turn may lead to higher error rates in the classification process. This noise removal is therefore essential for the system.

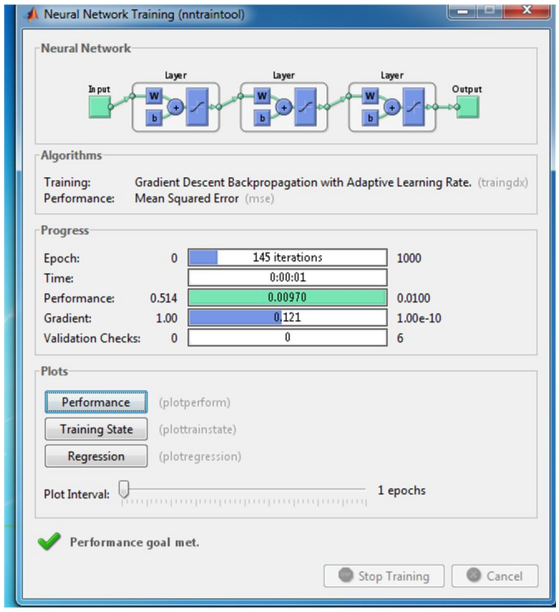


Fig 1 Neural network training

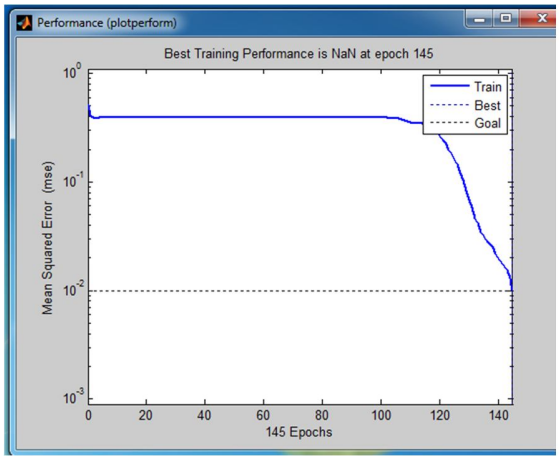


Fig.2 Training Performance

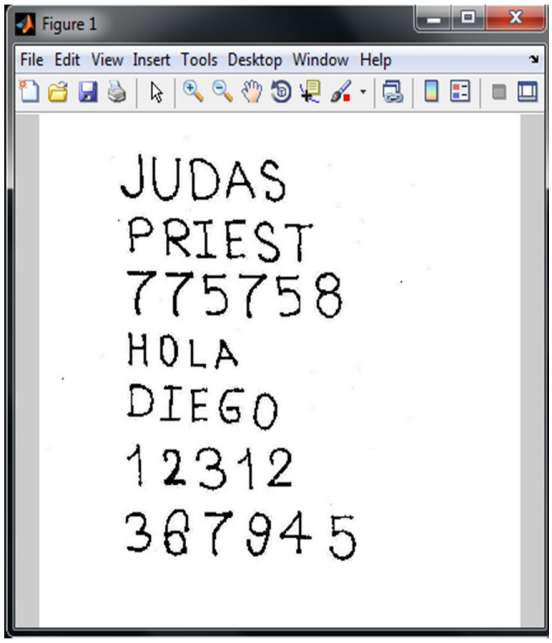


Fig 3 Input colored image

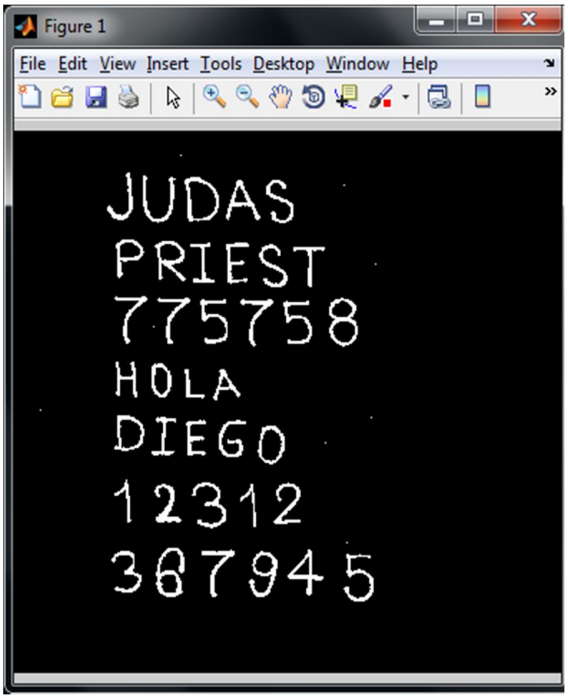


Fig.4 Gray scale image

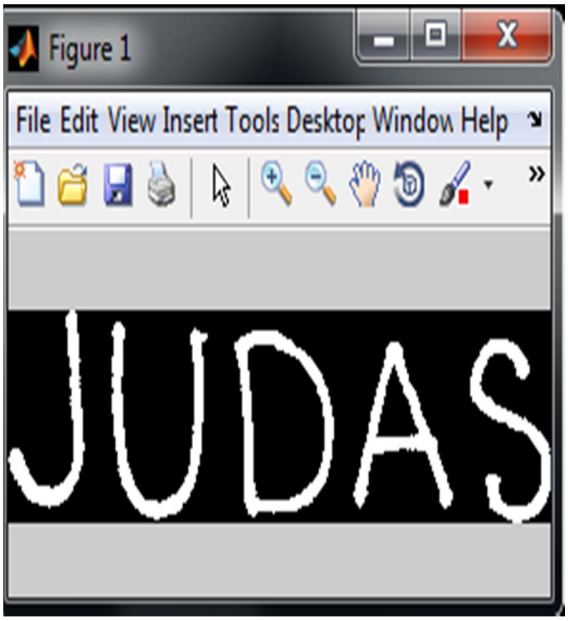


Fig 5 feature extraction

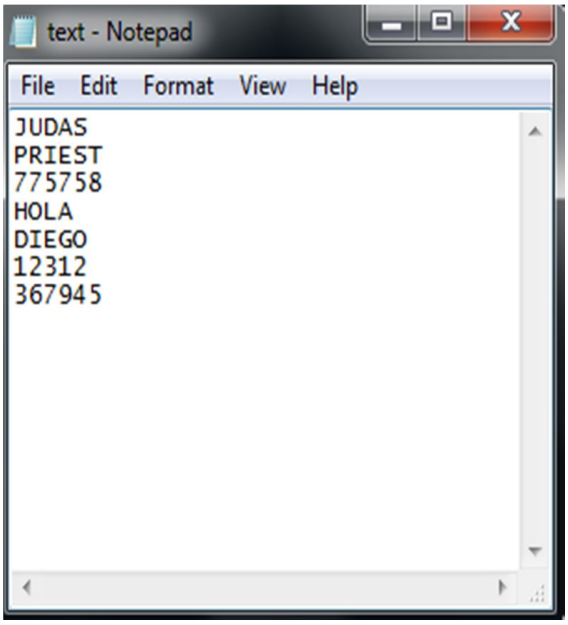


Fig. 7 Final output

Below GUI show the Recognition of the 1.

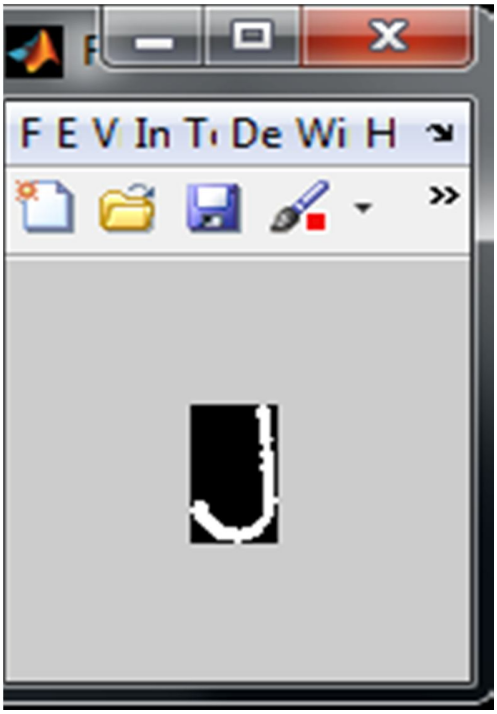


Fig. 6 feature extraction

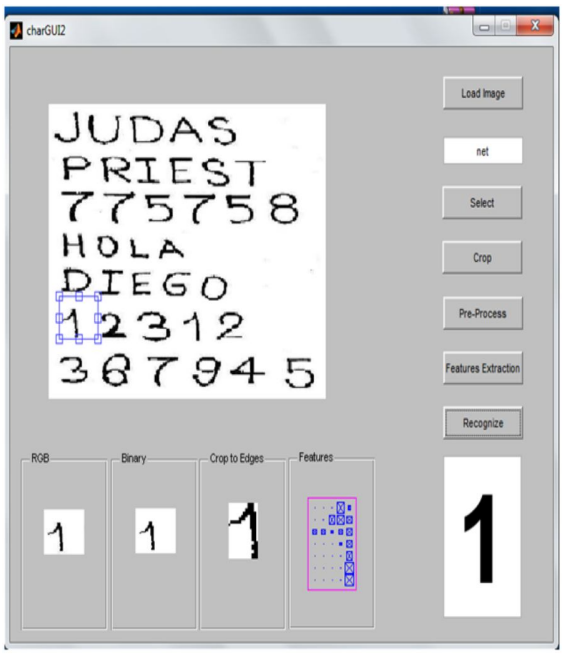


Fig .8 Recognition of 1

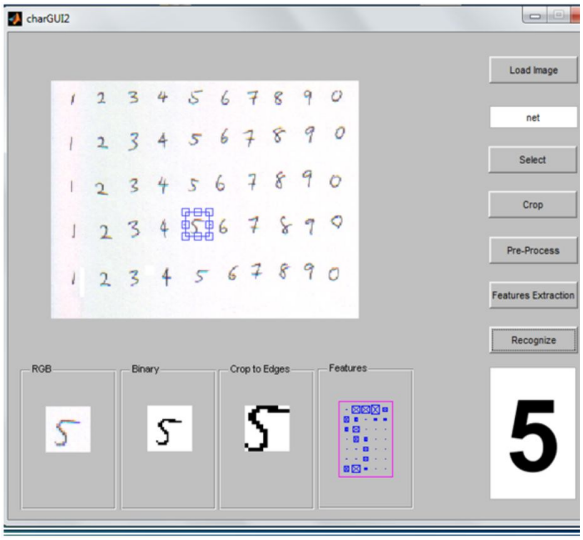


Fig .9 Recognition of 5

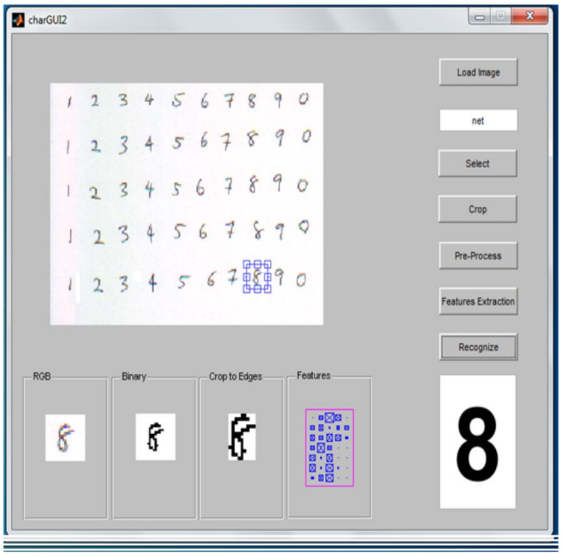


Fig .10 Recognition of 8

VII.COCLUSION

The paper gives a useful method for the recognition of handwritten characters to a great extent. The proposed method has been applied on different unknown characters. Neural network based method gives the accuracy 85 %. Developed for Proposed algorithms cannot be applied to recognize a cursive handwriting Recognition..

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