# Character Recognition using Back Propagation Neural Network

Roopali Gupta
*roopali2009@yahoo.in*

Prof. Neeraj Shukla

***Abstract -*** **In this paper we present a novel approach for hand written character recognition using image processing and feed forward neural network using gradient decent back propagation algorithm. Input to the system is in jpeg format picture which is then processed using different methods to extract feature of selected input. Extracted features are then applied to a neural network recognizer to produce recognized output.**

***Keywords -*** **Image processing, neural network, back propagation algorithm, jpeg format.**

## I. INTRODUCTION

The character recognition is a way to solve out problem faced with hand printed characters. With ever increasing requirement for office automation, it is imperative to provide practical and effective solutions. It has been noticed that all sorts of structural, topological and statistical information about the characters does not provide a helping hand in the recognition process due to different writing styles and moods of persons at the time of writing. Hand written character recognition can be widely used for post offices, banks, airports and airline offices. Character recognition software is also used in scanners and faxes that allow the user to turn graphic images of text into editable documents.

This paper presents the character recognition using neural network in MATLAB. First work in the field of CR is done by Tyuring [1]. The period from 1980 - 1990 witnessed a growth in CR system development due to rapid growth in information technology [3], [6], [8].

In this paper we browse a hand written image, resize it using edge-detection method then extracting its feature vector for training and classification feed this feature vectors in neural network
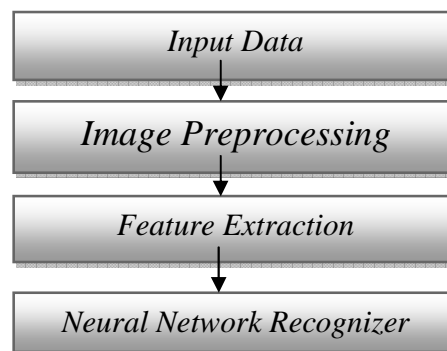
## II. Character recognition system



Figure 1.Methodlogy

### A. Edge detection

The variations of image features, usually brightness, give rise to edges. More objectively, the edges are the representations of the discontinuities of image intensity function. Therefore, edge detection algorithm is essentially a process of detection of these discontinuities in an image. Edge detection is an essential tool for estimation of geometrical properties of objects in image analysis, which leads to accurate identification and recognition. Edges form boundary or an outline of an object which segregates

**IJDACR**
International Journal Of Digital Application & Contemporary Research

# International Journal of Digital Application & Contemporary research
**Website: www.ijdacr.com (Volume 1, Issue 2, September 2012)**

2D planar shapes or objects from the background in a digital image. Boundary between overlapping objects is distinguishable, if edges in an image are identified accurately. The basic shape and topological properties of an object are present in boundary representation.

### B. Feature Extraction

Feature extraction is an important step in achieving best performance with respect to the implementation of a character recognizer, which will have high efficiency, and low error rate for the recognition of characters. Feature extraction means to determine various attributes as well as properties associated with a region or object. The objective of feature extraction is to represent an object in a compact way that facilitate image analysis task in terms of algorithmic simplicity and computational efficiency. Selection of feature extraction methods is probably the most important factor in achieving high recognition performance.

### C. Neural Network

A Neural Network is a function with adjustable or tunable parameters. Let the input to a neural network be denoted by x. This is a real valued or row vector of length and is typically referred to as input or input vector .the length of x is the number of input to the network. So let the network output is denoted as $\hat{y}$ .this is an approximation of the desired output y, which is also a real valued vector having one or more components and the number of outputs from the network. The data set contain many input and output pairs. The x and y denote matrix with one input and one output vector on each row.

The following diagram shows an example of one hidden layer neural network with three input, x = $(x_1, x_2, x_3)$
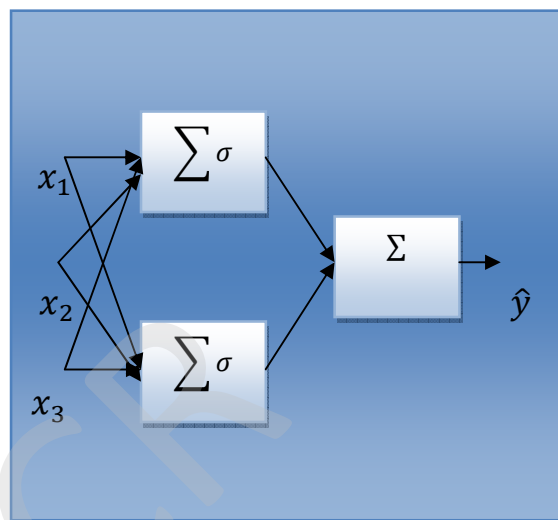


Figure 2.Neural Network with 3 inputs, two hidden neurons and one output neuron.

The three inputs are each is feed to the two neurons into the hidden layer the output of two neurons are then feed to one output layer neuron. This produce output $\hat{y}$

Artificial Neural Network is a collection of very simple and massively interconnected cells. The cells are arranged in such a way that each derives its input from one or more other cells. It is linked through weighted connections to one or more other cells. This way input to the ANN is distributed throughout the network so that an output is in the form of one or more activated cells. The information in an ANN is always stored in a number of parameters. These parameters can be pre-set by the operators or training by presenting the ANN with example of input and also possibly together with the desired output .The following is an example of a simple of ANN.
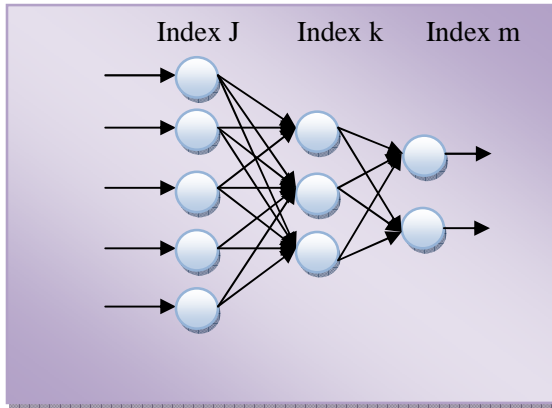
# IJDACR
International Journal Of Digital Application & Contemporary Research

## International Journal of Digital Application & Contemporary research
### Website: www.ijdacr.com (Volume 1, Issue 2, September 2012)



Figure 3.Multi-layer Artificial Neural Network

III. Results



Figure 4.input image



Figure 5.RGB view



Figure 6.Binary view



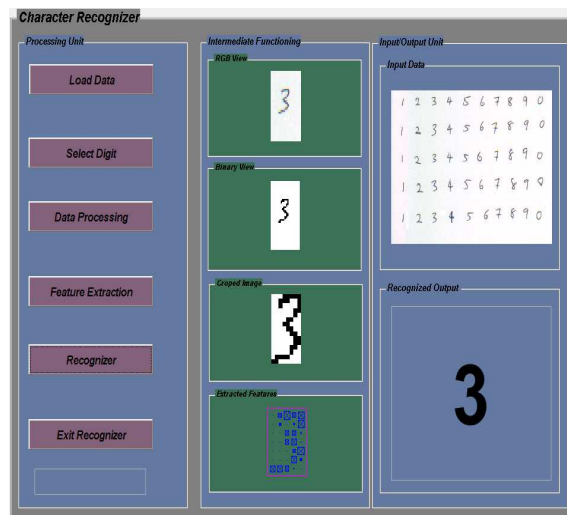Figure 6.Croped image



Figure 8.Extracted image



Figure 9.final GUI of character Recognition

## IV.    Conclusion

In this paper a system for handwritten character recognition using image processing and neural network has been developed and the performance has been evaluated for numeric data. The use of gradient decent back propagation algorithm has improved the performance of neural network. Results are shown in fig-9 with complete processes of the system.

References

[1]   J. Mantas, \An overview of character recognition methodologies," Pattern Recognition, vol. 19, no. 6, pp. 425 {430, 1986.

[2]   Aha, D. W., Kibler, D. & Albert, M. K. (1991) Instance-based learning algorithms. Machine Learning 6(1), 37–66.

[3]   R. Bozinovic and S. Srihari, \O_-line cursive script word recognition," Pattern Analysis and Machine Intelligence, IEEE Transactions on, vol. 11, pp. 68 83, Jan. 1989.

[4]   Claus,D.'HandwrittenDigitRecognition',http//:www.robots.ox.ac.uk/~dclaus.

[5]   NeuralNetworks.2003,http://documentswolfram/.com/applications/neuralnetworks/index2.html

[6]   V. Govindan and A. Shivaprasad, \Character recognition { a review," Pattern Recognition, vol. 23, no. 7, pp. 671 { 683, 1990.

[7]   ArtificialNeuralNertwork,1997,http://www.emsl.pnl.gov/proj/neuron/neural/what.html

[8]   Q. Tian, P. Zhang, T. Alexander, and Y. Kim,\Survey: omnifont-printed character recognition," in Society of Photo-Optical Instru-mentation Engineers (SPIE) Conference Series (K.-H. Tzou & T. Koga, ed.), vol. 1606 of Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, pp. 260{268, Nov. 1991.