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Noisy Character Recognition Using Artificial Neural Network

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Abstract
In This research aims at designing and developing a Neural Network based Character recognition system, capable of recognizing a character correctly from noise. Neural Networks which bears highly parallel architecture, are becoming more and more fault tolerant; thus making it very suitable for problems like pattern matching, character recognition etc. We assume that we have acquired images of different English Alphabets, and during this acquisition the images get distorted due to various reasons. We used Neural Network Toolbox in MATLAB. MATLAB has very powerful environment for supporting Neural Network Algorithms. MATLAB provides various tools for designing & training Neural Network. The following screenshot shows the GUI (Graphical User Interface) of the application developed.

Keywords
Character Recognition, Neural Network, Character Extraction algorithm, Edge Detection algorithm, Image acquisition.

I. Introduction

One of the classical applications of Artificial Neural Network is Noisy Character Recognition. Character Recognition finds its applications in a number if area, such as in banking, security products, hospitals, evaluations of examination papers, answer sheets and even in robotics.

In this project we aim to design and implement a neural network for performing character recognition. Because of the great flexibility in MATLAB's Neural Network Toolbox, we will be using it for the whole implementation.

II. Neural Networks

Neural Network is formed by interconnecting a number of elements called neurons in different layers together. These neurons work in a same manner as they do in biological terms. Consider a system in which a neural network is formed using three layers –Input , Hidden and Output as Shown in figure where Input layer is used to fed all the input data. which is followed by a hidden layers of neurons for further processing of data and finally the output layer of neurons for calculating the desired response of the Neural network Created.

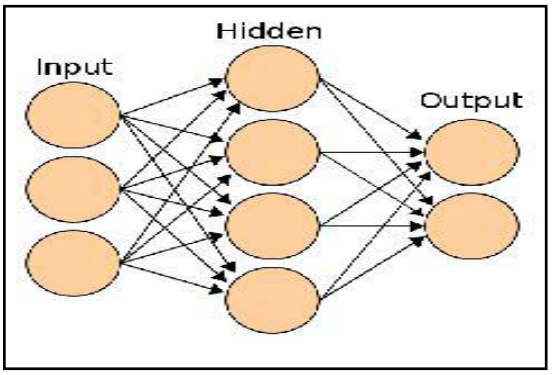

Fig. Diagram of a neural network

The above figure shows the three layers of a neural network-input, hidden and output layer.The output of individual neuron can be given by:

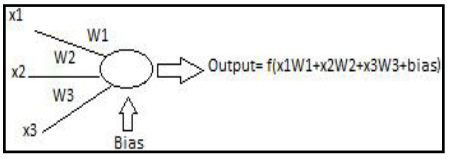

Fig. Output of individual Neuron

OUTPUT=f(X1W1+X2W2+X3W3) as shown in the above figure , where X1,X2and X3 are the inputs whereas W1,W2 and W3 are weight in that layer.

Some functions used in Neural Network are as follows:-

In Multilayer neural networks , Log-sigmoid transfer functioncalled Logsig are frequently used.

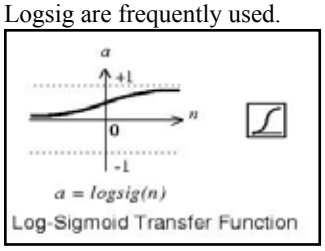

Fig. Log-Sigmoid Transfer Function

The above figure shows that the logsig function gives the outputs between 0 and 1 whenever the neuron's net input goes from negative to positive infinity as shown in the above figure.Tan –sigmoid transfer function Tansig can also be used in Multilayer networks.

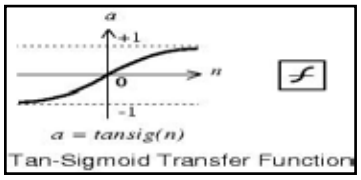

Fig. Tan-Sigmoid Transfer Function

III. Some of the features of MATLAB include:

- Ability to zip and unzip files and folders in the Current Folder browser to simplify sharing of files
- New visual cues in the Current Folder browser to show directories on the MATLAB path
- Enhanced tab completion in the MATLAB Editor with support for local variables, subfunctions, and nested functions .
- Expanded access in the plot selector to plots from the Curve Fitting, Filter Design, Image Processing, and Signal Processing Toolboxes.

IV. Basically we are roughly dividing the whole project in three parts:

- The first part consists of creating a simple neural network using MATLAB, thus getting acquainted with the functions and tools that MATLAB has to offer.
- The second part will focus on character recognition, in which

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the difference between training a network with data that is noisy or not noisy will be highlighted, (and optionally the interpretation and response to English letters under five different noise levels).

- The last part will deal with designing and creating a neural network in which we will focus on how parameter changes and data manipulation can influence our design.

V. Figures of praposed model And Steps:

a. Design steps :

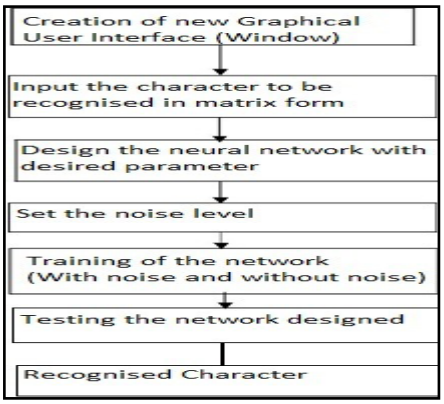

Fig. Proposed Design Model

b: Figures of varrious activities during the perfomances of project research are attached as the process of reviews.

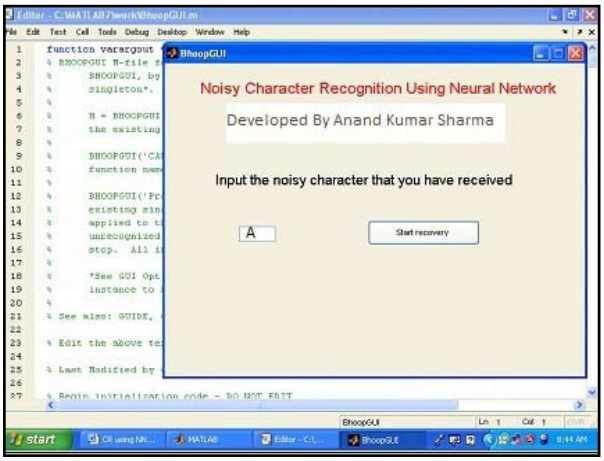

Fig: Screenshot of Input stage ANN system.

C. Table Captions

Table: Specific parameter of the system

Input Layer	1
Hidden Layer	2
Output Layer	3
No. of neurons in each hidden layer	8
Noise level	0.01

VI. Results and Applications-

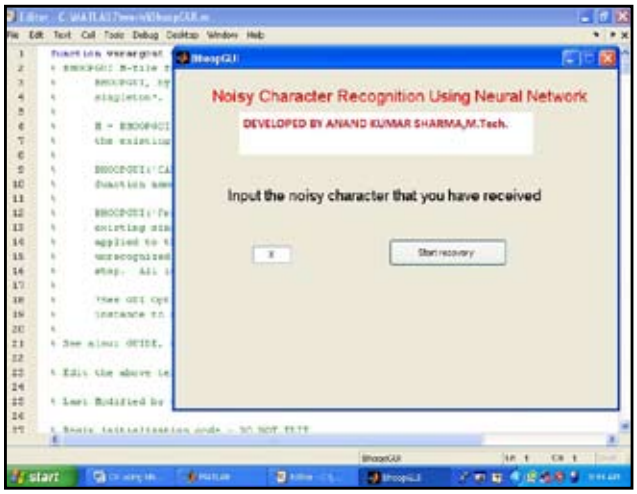

Fig. Screenshot of noisy character

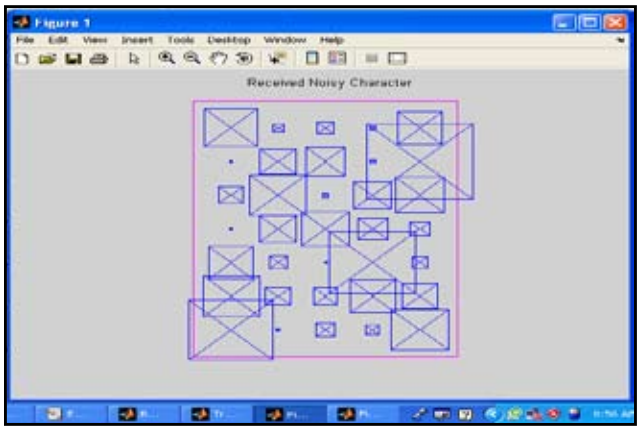

Fig. Noisy input X

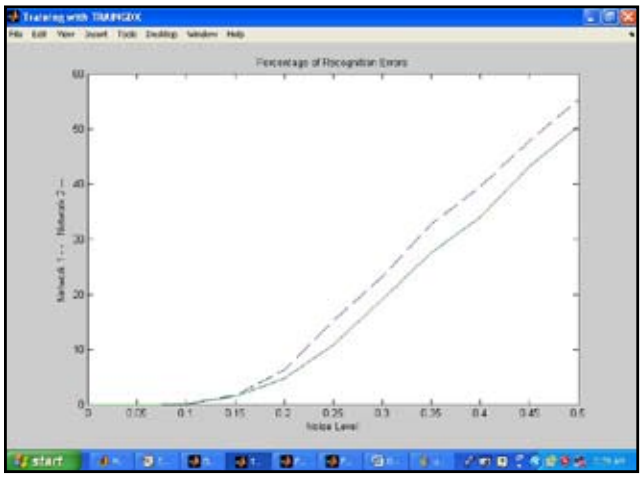

Fig. Noise level of X

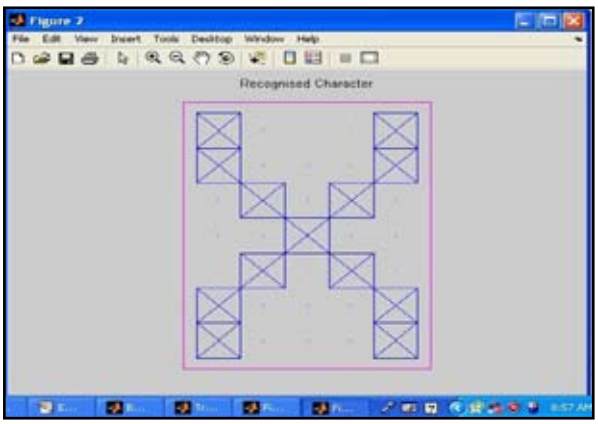

Fig. Recovered Output X

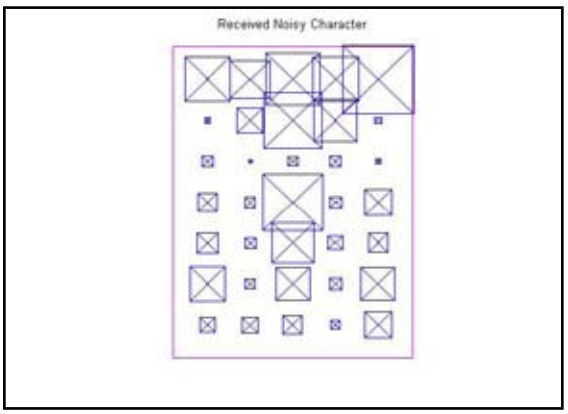

Fig. Noisy input T

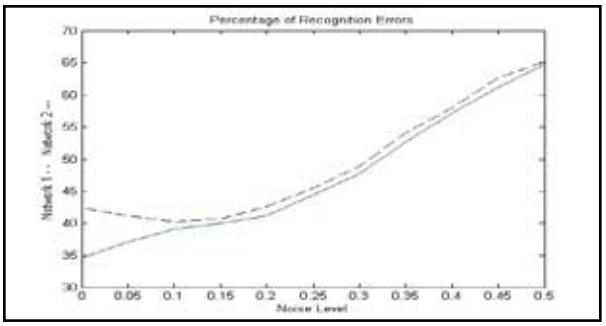

Fig. Noise level of T

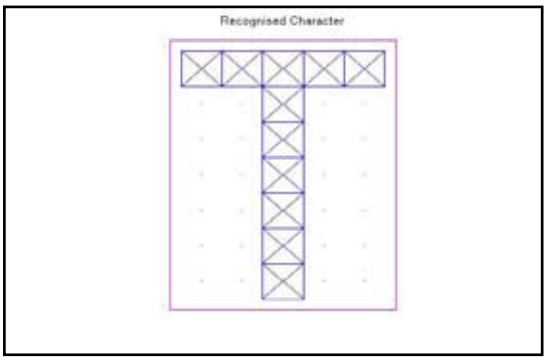

Fig. Recovered Output T

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VII. Conclusions

Our preliminary research in noisy character recognition clearly indicates that Neural Network can be a most important tool for the implementation of the Character Recognition System. Further the latest CAD tools such as MATLAB, can provide us with greater flexibility and enhance the efficiency and productivity of the developers by reducing the complexity of coding.finaly in future the entire algorithm will be implemented on embedded system (AVR MICROCONTROLLER BOARD WITH USB PROGRAMMER).

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