Handwritten Character and Digit Recognition Using Artificial Neural Networks

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Abstract: Handwritten character and digit recognition plays important role in the modern world. It can solve more complex problems and makes human's job easier. There are different techniques that can be used to recognize handwritten digits and characters. In this paper we use the multilayer perception artificial neural network to recognize the handwritten digits and characters. Character reorganization device is one of such smart devices that acquire partial human intelligence with the ability to capture and recognize various characters and digits. In this MLP network is use the back propagation algorithm to train and test the data.

Index Terms: Artificial neural network, MLP, back propagation.

I. Introduction

Artificial Neural Network (ANN) is information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons now a day's ANN applied a lot of real world problems. These problems consider complex problems.ANN is also good pattern recognization and robust classifiers. They have the ability to generalize by making decisions about imprecise input data. Artificial Neural Network (ANN) is a collection of very simple and massively interconnected cells. The cells are arranged in a way that each cell 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 always stored in a number of parameters. These parameters can be pre-set by the operator or trained by presenting the ANN with examples of input and also possibly together with the desired output.

 Example of simple ANN:
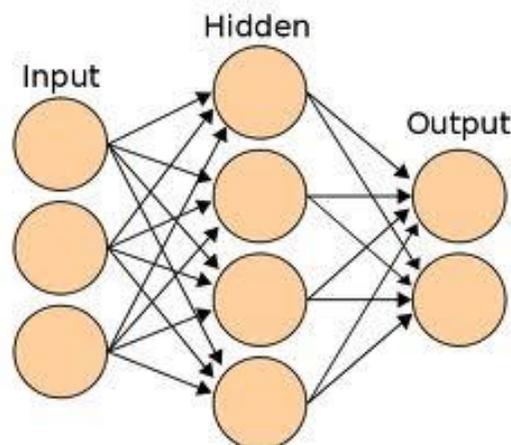
        In multi layer feed forward neural network have three layered network, the first layer connect to input variables. This layer is called input layer. The last layer connects output variables. This is called output layer. Layers between input and output called hidden layer. In a system there can be more than one hidden layer. The processing unit elements are called nodes. The parameters associated with node connections are called weights.

Neural networks have seen an explosion of interest over the last few years, and are being successfully applied across an extraordinary range of problem domains, in areas as diverse as finance, medicine, engineering, geology and physics. Indeed, anywhere that there are problems of prediction, classification or control, neural networks are being introduced. This sweeping success can be attributed to a few key factors:

Power: Neural networks are very sophisticated modeling techniques capable of modeling extremely complex functions. In particular, neural networks are nonlinear. For many years linear modeling has been the commonly used technique in most modeling domains since linear models have well-known optimization strategies. Where the linear approximation was not valid (which was frequently the case) the models suffered accordingly. Neural networks also keep in check the curse of dimensionality problem that bedevils attempts to model nonlinear functions with large numbers of variables.

Ease of use: Neural networks learn by example. The neural network user gathers representative data, and then invokes training algorithms to automatically learn the structure of the data. Although the user does need to have some heuristic knowledge of how to select and prepare data, how to select an appropriate neural network, and how to interpret the results, the level of user knowledge needed to successfully apply neural networks is much lower than would be the case using (for example) some more traditional nonlinear statistical methods

II.Back propagation algorithm

Back propagation algorithm consists of two phases. First phase is forward phase. This is the phase where the activations propagate from input layer to the output layer. The second phase is backward phase. This phase where the error between the observed actual value and the requested nominal value in the output layer are propagated backwards so it can modify the weights and bias values
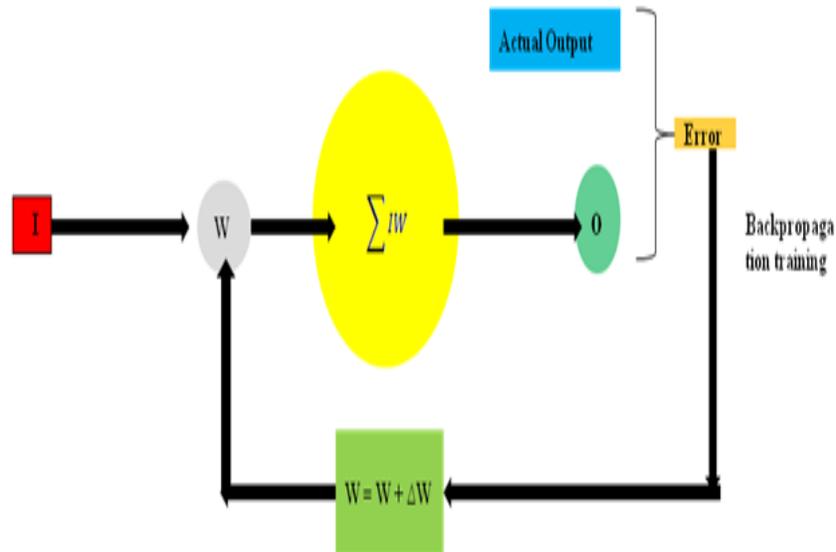
Applications of ANN:
➢ Speech Recognition
➢ Classification of radar signals
➢ Remote Sensing and image classification
➢ Handwritten character/digits Recognition
➢ ECG/EEG/EMG Filtering/Classification
➢ Credit card application screening
➢ Data mining, Information retrieval of Artificial neural network
➢ Machine Control/Robot manipulation
➢ Financial/Scientific/Engineering Time series forecasting.
➢ Inverse modeling of vocal tract

Artificial Neural network based handwritten digit and character recognition:
Artificial neural network is used to recognize ten different handwritten digits. These digits from 0 to 9 and characters are A-Z. I n order to have a learning task that is reasonably workable, a great amount of preprocessing of the digit is carried out using conventional Artificial Intelligence (AI) techniques. This is done before digits are fed to Ann.
In fig1 numbers of layers are 1, 2,3 and the maximum error will given to 1.1
No of input layers will be 295 and the no of hidden layers will be 98 and no of output units will Be 36. In fig2 drawing character will be 'X' in this 'X' will be recognize 83% high. Here error rate is 1.089 and Iterations will Be 78 and the time is 03 sec .
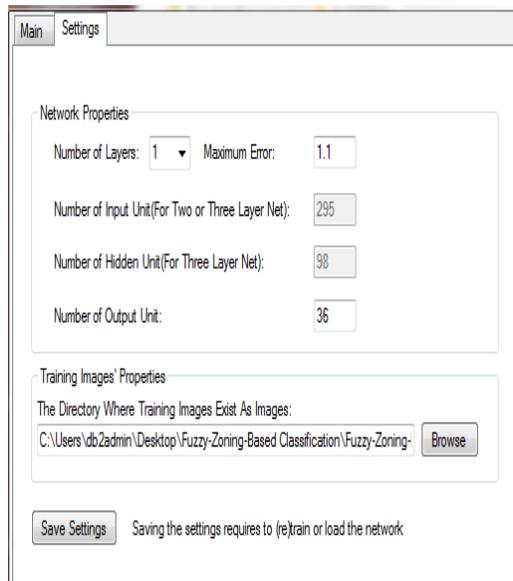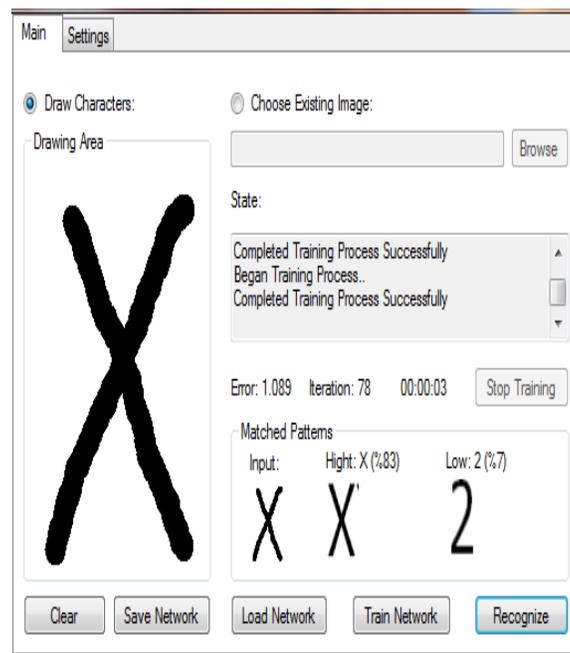
Fig1:MLPnetwork

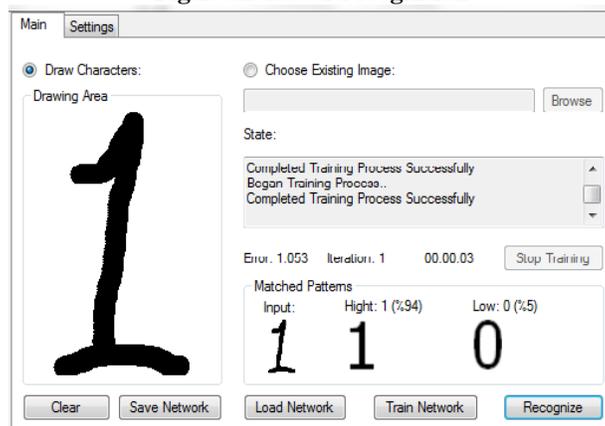

Fig 2: character recognition

Fig 3: handwritten digit recognition

III.Conclusion

This dissertation presented a new system for handwritten text recognition based on an improved artificial neural network .In this still we have improved network. Artificial neural networks offer several advantages in pattern recognition and classification in the sense of emulating adaptive human intelligence to a small extent.`

References
[1]   Miguel po-hsin wu hand written character recognition
[2]   Handwritten Character Recognition using Neural Networks Sunith Bandaru
[3]   Handwritten Character Recognition Using Multiscale Neural Network Training Technique Velappa Ganapathy, and Kok Leong Lie
[4]   Hand Written Character Recognition Using Artificial Neural Network Vinita Dutt1,*, Sunil Dutt2
[5]   Visual Character Recognition using Artificial Neural Networks ShashankAraokar MGM's College of Engineering and Technology, University of Mumbai, India
[6]   Prof. George Papadourakis, Ph.D. Introduction to Neural Networks