Abstract

Artificial Neural Network was introduced to model the way in which the brain performs a particular task or function of interest. Neural networks are constructed using different training algorithms. Training can be viewed as a nonlinear optimization problem in which the goal is to find a set of network weights that minimizes a cost function. The cost function, which is usually a function of the network errors, describes a surface in the weight space, often referred to as the error surface. Training algorithm can be viewed as a method for searching minimum of this surface.

Eventhough there are lot of learning algorithms for different types of problems, still the artificial intelligence incorporated in the neural network is only to the level of tapeworm. Researches are going, in different directions by finding new cost functions, topology and training algorithms to minimize the error surface and solve the real life complex problems. In this study, concentration has been given to overcome the problems faced in backpropagation method, and proposed new efficient algorithms for the single hidden layer feedforward networks.

New learning algorithms are proposed by combining simultaneous perturbation approach, dynamic tunneling and newly proposed modified tunneling for constructing a single hidden layer neural networks. Forward selection initialization
procedure is used to initialize every hidden neuron unit to construct the network. Simultaneous perturbation technique is used to train the network and dynamic tunneling or modified tunneling technique based on additional perturbation is employed to detraps the local minimum which are trapped during training. Synaptic weights are updated by learning rule or only through perturbations that is without learning rule. Cascading procedure is used to construct the network or heuristically selected network is used for training.

A modified algorithm is proposed to train the heuristically selected fixed size neural network, based on the sum of the linear and nonlinear quadratic errors of the output neuron. In this algorithm, the network is trained layer by layer. Different optimization criterions are used to train the output layer and hidden layer neurons. Fictitious teacher signals are calculated for the hidden layer neurons. Updating rules are used to modify the hidden layer weights and output layer weights.

The proposed learning algorithms are computationally efficient and provide stable convergence in the learning process for the selected problems. Number of epochs and hidden neurons required to converge for the selected examples in the simulation prove the efficiency of the each of the proposed algorithm.