



AN OPTIMIZED RECURSIVE LEARNING ALGORITHM FOR THREE-LAYER FEEDFORWARD NEURAL NETWORKS FOR MIMO NONLINEAR SYSTEM IDENTIFICATIONS

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ABSTRACT—Back-propagation with gradient method is the most popular learning algorithm for feed-forward neural networks. However, it is critical to determine a proper fixed learning rate for the algorithm. In this paper, an optimized recursive algorithm is presented for online learning based on matrix operation and optimization methods analytically, which can avoid the trouble to select a proper learning rate for the gradient method. The proof of weak convergence of the proposed algorithm also is given. Although this approach is proposed for three-layer, feed-forward neural networks, it could be extended to multiple layer feed-forward neural networks. The effectiveness of the proposed algorithms applied to the identification of behavior of a two-input and two-output non-linear dynamic system is demonstrated by simulation experiments.

Key Words: Neural Networks, Learning Algorithms, Back Propagation, Gradient Descent Method