ABSTRACT

Performance Enhancement Of Backpropagation Algorithm Using Momentum And Learningrate With a Case Study On Fingerprint Recognition

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Artificial Neural Network (ANN) is a branch of artificial intelligence theory that has been used in various applications such as pattern recognition. The advantages of ANN as a system is the ability to imitate human thoughts in computational intelligence such as pattern recognition. ANN is useful to do modelling prediction, error detection and control systems with artificial intelligence approaches and computational design.

There are 3 methods that commonly used in ANN heuristic rule, delta-delta rule, and delta-bar-delta rule. Delta-bar-delta rule that use by backpropagation method is the best algorithm to solve the problem input to the network [5]. By applying learning rate [3] in backpropagation algorithm, learning process will be more stable and faster in finding the optimal in the delta (stepsize) by reducing error for optimal solution. Shao and Zheng [4] apply momentum in backpropagation algorithm and the result shows that the error sequence is monotonously decreased during the training procedure and the algorithm is weakly convergent, the gradient of error sequence converges to zero as the training iteration goes on.

Fingerprint is one of Biometric identity measurement using pattern recognition that is important to determine the accuracy of personal identification. Fingerprints had strong nature of unchangeable over time and each person is different from the others from one person to another. Conventional biometric fingerprint technology sometimes is inaccurate because the fingerprint position is altered in scanner tools. This disadvantage can be minimize using ANN method with Backpropagation algorithm. Fingerprint recognition using standard backpropagation shows 66,91% average accuracy and 225 seconds of average training time. The accuracy increases by adding momentum and learning rate with gradual value in Backpropagation algorithm. Average accuracy of 80,9% can be achieved using combination of momentum and learningrate, and 144 seconds average training time.

Keywords: Neural Networks, fingerprint patterns, Backpropagation, momentum, learningrate