Proceedings of Iran International Aluminium Conference (IIAC2018)
April 24-25, 2018, Tehran, I.R. Iran

Buckling Analysis of Cracked Composite Aluminum Column Using Neural Network

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Abstract: Acquiring bucking critical load by the means of complex equations which is expecting to be finally solved by proving or eliminating various parameters via numerical or analytical methods is exclusively limiting our freedom to alter problem's variables. We designed a neural network to model bucking of a cracked composite aluminum. Network training data (inputs and outputs) is obtained from analytical calculations. To train the network, Levenberg-Marquardt algorithm has been used. Then the network is tested using the crack angle, crack depth, fiber volume and crack place as input variables. Hence a neural network can be used to analyze this type of bucking process and represent respective inputs which determine problem condition in order to produce output network which is the same critical load. The network manufactured for this process is a three-layer perceptron network (with a hidden layer) with an error back propagation rule. To implement this network, MATLAB software has also been used. Researches show that only three layers are needed; it has been verified that the three-layer perceptron with Sigmoid Output Function are comprehensive approximations. These perceptron can be trained for the approximation of any kind of function in which the accuracy of the applied approximation depends on the number of neurons in the hidden layer.

Key words: Bucking, Perceptron, Error Back Propagation, Neural Network, Composite Column, Levenberg-Marquardt Algorithm