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Structural steel plate damage detection using non destructive testing, frame energy based statistical features and artificial neural networks

Abstract

This paper discusses about the detection of damages present in the steel plates using nondestructive vibration testing. A simple experimental model has been developed to hold the steel plate complying with the simply supported boundary condition. Vibration patterns from the steel structure are captured based on the impact testing using a simple protocol. The vibration signals in normal condition of the steel plate are recorded. The damages of size 512 μ m to 1852 μ m are simulated manually on the steel plate using drill bits. The vibration signals in the fault condition of the steel plate are collected. The captured vibration signals are preprocessed and time domain based feature extraction algorithms are developed to extract features from the vibration signals. The conditions of the steel plate namely healthy and faulty are associated with the extracted features to establish input output mapping. A feed-forward neural neural networkis modeled to classify the condition. The neural network parameters are adjusted to train the network. The performance of the network is calculated using Falhman criterion.

Keywords

Feed-forward neural network; Frame energy based statistical features; Non destructive testing; Vibration signals