Artificial neural network for random fatigue loading analysis including the effect of mean stress

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Abstract

The effect of mean stress is a significant factor in design for fatigue, especially under high cycle service conditions. The incorporation of mean stress effect in random loading fatigue problems using the frequency domain method is still a challenge. The problem is due to the fact that all cycle by cycle mean stress effects are aggregated during the Fourier transform process into a single zero frequency content. Artificial neural network (ANN) has great scope for non-linear generalization. This paper presents artificial neural network methods for including the effect of mean stress in the frequency domain approach for predicting fatigue damage. The materials considered in this work are metallic alloys. The results obtained present the ANN method as a viable approach to make fatigue damage predictions including the effect of mean stress. Greater resolution was obtained with the ANN method than with other available methods.

Keywords random fatigue, frequency, time domain, artificial neural networks, Dirlik, mean stress.

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