Postprint: Cable Damage Identification in Cable-Stayed Bridges Under Moving Loads Based on Principal Component Analysis

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Abstract

A cable damage identification method for cable-stayed bridges based on principal component analysis is proposed to achieve cable damage identification. The method first acquires the acceleration response of the cable structure when a moving load excites the bridge deck, then employs principal component analysis to perform dimensionality reduction on the time-domain signals, extracts statistical data from the dimensionality-reduced signals, and combines Dempster-Shafer (D-S) evidence theory to construct a multi-order statistical moment fusion index for identification. Taking Yonghe Bridge in Tianjin as an example, finite element numerical simulation is utilized to separately investigate the effects of cable damage extent, load mass, and load moving speed on damage identification accuracy. The analysis results demonstrate that the proposed method has good identification performance and favorable noise robustness.

Full Text

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