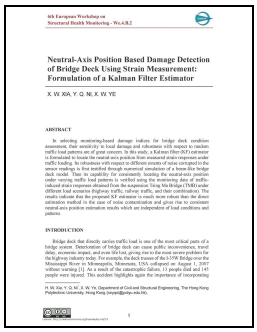

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H.W. Xia, Y.Q. Ni, X.W. Ye

Neutral-Axis Position Based Damage Detection of Bridge Deck Using Strain Measurement: Formulation of a Kalman Filter Estimator

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In selecting monitoring-based damage indices for bridge deck condition assessment, their sensitivity to local damage and robustness with respect to random traffic load patterns are of great concern. In this study, a Kalman filter (KF) estimator is formulated to locate the neutral-axis position from measured strain responses under traffic loading. Its robustness with respect to different extents of noise corrupted in the sensor readings is first testified through numerical simulation of a beam-like bridge deck model. Then its capability for consistently locating the neutral-axis position under varying traffic load patterns is verified using the monitoring data of traffic-induced strain responses obtained from the suspension Tsing Ma Bridge (TMB) under different load scenarios (highway traffic, railway traffic, and their combination). The results indicate that the proposed KF estimator is much more robust than the direct estimation method in the case of noise contamination and gives rise to consistent neutral-axis position estimation results which are independent of load conditions and patterns.

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Ключевые слова:

Содержание