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Neutral-Axis Position Based Damage Detection of Bridge Deck Using Strain Measurement: Numerical and Experimental Verifications

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This paper provides numerical and experimental studies on using the neutral-axis position as a damage index for bridge deck condition assessment. A beam-like deck model subjected to moving bogies is fabricated with crack damage of different extents incurred on a designated cross-section. Making use of a Kalman filter (KF) estimator which is specifically formulated to estimate the neutral-axis position from traffic-induced strain responses, numerical simulations and experiments of the deck model are conducted to verify the sensitivity of the neutral-axis position based damage detection technique to crack damage and the capability of this technique for locating damage. The robustness of the KF estimator is examined under different boundary conditions and under static and moving loads. Both the numerical and experimental results show that the neutral-axis position is highly sensitive to local damage on deck sections and can as well serve as an indicator of damage location when strain sensors are densely instrumented.

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Ключевые слова:

Содержание

Abstract
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Estimation of neutral-axis position
Scale model of bridge deck
Numerical simulations
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Conclusions
Acknowledgements