Dynamic Reliability Assessment for Long-Span Bridges under Heavy Stochastic Traffic Flow loads

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Abstract

Long-span highway bridges simultaneously suffer from a large number of vehicle loads. With the ever-increase of the traffic loads, the safety problem of the in-service bridges is particularly serious, see Bu et al. (2006), Deng et al. (2015), Chen and Wu (2009). A framework for the analysis of the first-passage reliability of long-span bridges under stochastic traffic flows was proposed integrating the measured traffic information, numerical simulation of vehicle-bridge interaction, and dynamic reliability theory. A suspension bridge with main-span of 820m was chosen as an engineering prototype for the purpose of illustrating the feasibility of the proposed framework. The numerical results indicate that: the stochastic traffic flow model is appropriate to be applied in reliability analysis of bridges, because the probabilistic information was included in the stochastic traffic flow and the corresponding probabilistic model of dynamic response of bridges can be obtained by the numerical simulation of vehicle-bridge interaction; the main event that cause the failure of the in-service bridges for the traffic flow is the busy traffic flow, and the corresponding failure probability increases with the increase of the occupancy of the busy traffic flow in the daily traffic flow.

References

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