Study on Traffic-induced Vibration of a Cable-stayed bridge

CHEN RONGXIU   Keywords: Traffic-induced vibration, cable-stayed bridge, FEM

【Background】

Large portions of highway bridges locate where people live and work nearby. The traffic-induced vibration influences negatively bridge health and driving comfort. Moreover, the effects of low frequency sound caused by vehicle-induced vibration of those highway bridges on people's living and working is getting serious, such as mental pressure. Currently, this environmental vibration becomes more serious as the traffic and vehicle load increase. Theoretical analysis and corresponding reduction, therefore, is an important technical issue.

【Objective】

➢ To conduct eigenvalue analysis to validate the bridge FE model.
➢ To investigate vehicle-induced vibration of a cable-stayed bridge in various scenarios.
➢ To provide bridge velocity data for future study of low frequency sound of the cable-stayed bridge.

【Approach】

Traffic-induced vibration analysis is carried out utilizing FE method. Guyan reduction is performed to improve the calculation efficiency. With the roadway surface taken into account and Largrange equation of motion used, the governing equations of motion for the three-dimensional vehicle-bridge interaction sys-tem were derived. Newmark's β method was used to solve the coupled vehicle-bridge interaction system.
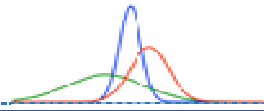
【Publication plan】

・None for the time being.

【Results】

In the case where 10 vehicles/lane in the left three lanes ran through the bridge, the bridge responses are shown in the following:

【Future plan】

➢ Check the programs and validate the analysis results data.
➢ Carry out analysis of low frequency sound of the bridge.

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【Results】

In the case where 10 vehicles/lane in the left three lanes ran through the bridge, the bridge responses are shown in the following:

Observation node