

Static and dynamic responses of bridges under lane-free traffic

NGUYEN Cuong

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【Background】

The introduction of fully connected and autonomous vehicles (CAVs), represents an important development in transportation systems. With the growth of CAVs, lane-free traffic (LFT) is introduced as a new traffic strategy. LFT allows vehicles to travel without following designated lanes, increasing road capacity. LFT raises new concerns for bridge engineers, requiring thorough preparation for future scenarios.

【Objective】

The objectives include extracting the dynamic response of bridges and reviewing how various aspects of bridge design, such as the distribution of live load and the dynamic amplification factor (DAF), adapt to this traffic scenario. Additionally, a stress analysis is conducted to evaluate the fatigue performance of both the main girders and the deck slab of the bridge. Furthermore, the study utilizes the dynamic response of vehicles to evaluate the ride comfort in the vibration serviceability of the bridge.

【Approach】

By conducting a simulation of the bridge under various assumptions based on lane-free traffic phenomenon, the behavior of the bridge could be observed to first describe the influence of this scenario and then evaluate the adaptation of the current bridge design. The simulation begins with a static approach and then moves on to a dynamic approach regarding the vehicle-bridge interaction. The dynamic response of the bridge is the primary outcome of this study's analysis.

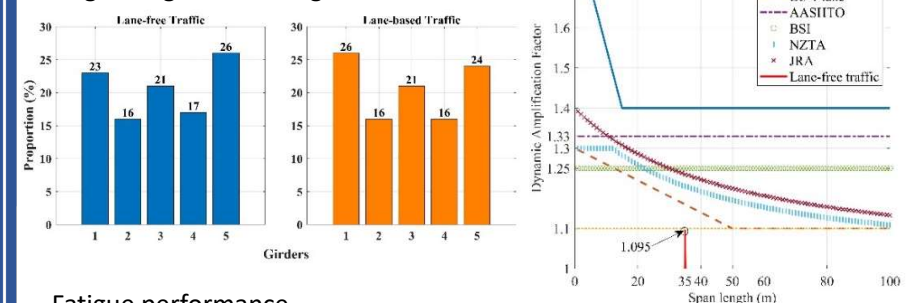
【Publication plan】

• JSCE Annual Conference

【Results】

The results show that although LFT generates a high dynamic response, it is well aligned with the current bridge design codes. The bridge's fatigue performance under lane-based traffic is better concerning main girders while LFT improves the fatigue performance of deck slab.

- Bridge design concerning



- Fatigue performance

