

Structural behavior of bridge under a lane-free traffic scenario

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【Background】

Although lanes are critical for aiding human drivers and improving safety and efficiency in contemporary traffic, their necessity in the case of a fully connected and automated environment can be questioned. In such a scenario, lanes may no longer be required as an organizational structure for regulating traffic flow. Rather, advanced traffic management systems utilizing innovative automation and communication technologies in a lane-free world have the potential to optimize the utilization of available road capacities. The current bridge design is entirely based on the concept of lane-based traffic. Therefore, a review is needed for some factors of the design procedure concerning lanes such as load distribution, dynamic amplification factor, and fatigue in serviceability.

【Objective】

This study aims to

- Investigate the bridge's structural response under lane-free traffic scenarios.
- Evaluate the positive and negative consequences of lane-free traffic when applied to practical bridge design.
- Compare with current bridge design specifications to review the adaption of them to this prospect

【Approach】

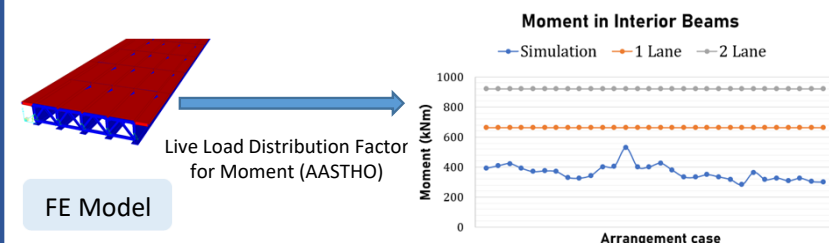
By conducting a simulation of the bridge under various assumptions based on lane-free traffic phenomenon, the behavior of the bridge could be observed to first describe the influence of this scenario and then evaluate the adaptation of the current bridge design. The simulation begins with a static approach 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】

Static Approach – Random vehicle arrangement



Dynamic Approach – VBI model

VBI 3-D simulation of a laboratory experiment

