# Estimation Of Truck Platooning Effects On Fatigue Safety Of A Pavement Structure Based On Traffic Monitoring Data

**Cheng PENG, Chengcheng TAO, Xiaoqiang HU, Yi JIANG, Shuo LI**

Traditional fatigue safety assessment and long-term health monitoring approaches of pavement-based structures such as roadways and bridges rely on a long period monitoring time of structure response. Simulation studies using finite element modeling of pavement structures, meanwhile, analyze dynamic responses under non-realistic types of simplified loading patterns. Direct monitoring data in Weigh-in-Motion (WIM) data provides actual traffic loading actions in real-world traffic. In this study, finite element modeling of pavement structures with typical types of asphalt/concrete overlay is combined with simulated truck axle loading prototypes developed from long-term monitoring data of real-world traffic for the fatigue life assessment. The proposed approach constructs multi-axle traffic action models identified from long-term traffic monitoring of truck platoons. A loading model of long-term truck platoon excitation is developed using frequent types of truck platoon loading models summarized from yearly traffic data records. Then, a simulation of truck platoon loading models and their effects was conducted using a finite element model to estimate pavement fatigue damage. A 3D finite element model was employed to examine pavement dynamic response subjected to multiaxial loading models with different axle configuration and estimate fatigue damage of the pavement structure based on long-term traffic monitoring of truck platoons. The simulation results of fatigue damages under platoon loading scenario are evaluated comparing with the conventional ESAL-based pavement performance prediction method. Findings of this simulation analysis can be used to enhance long-term assessment of pavement fatigue safety of pavement with consideration of continuous axle dynamic loading based on monitoring data of real-world traffic.