

On the Construction of a Safety Gap Prediction Model for Freeway Bus Lane-changing Maneuver Using Driving Simulator Data

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Abstract

Lane-change crashes are not only responsible for an important portion of vehicular fatalities, but also for crash-caused traffic delays, often resulting in congestion. The type of discretionary lane change was the focus of this research, in which a safety gap prediction model was constructed for potential application in the development of lane-change support systems. Data for analysis and model fitting were collected from a fixed-based bus driving simulator. The experimental scene designed for the driving simulator consisted of a straight section of two-lane freeway mainline with daylight and vehicular flows traveling at different speed levels on the road. Ten professional coach drivers were recruited to perform lane-change experiments. Results of two-way ANOVA revealed a significant lane-change direction \times vehicle speed in the target lane interaction, and further analyses demonstrated that there was a simple effect for vehicle speed in the target lane for the left-to-right group of the type of lane-change direction factor. A safety gap forecasting model with the time gap between lead and lag vehicle on the target lane as the forecasted variable was constructed, and tests of true out-of-sample forecast accuracy of the prediction model showed promising results for its potential application in the development of lane-change support systems.

Keyword : lane-change model, safety gap, bus, driving simulator, ANOVA