Split Models for Predicting Multivehicle Crashes During High-Speed and Low-Speed Operating Conditions on Freeways

Journal	Transportation Research Record: Journal of the Transportation Research Board
Publisher	Transportation Research Board of the National Academies
ISSN	0361-1981
Issue	Volume 1908 / 2005
Category	Safety and Human Performance
Pages	51-58
DOI	10.3141/1908-07
Online Date	Thursday, December 28, 2006

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Abstract

The future of traffic management and highway safety lies in proactive traffic management systems. Crash prediction models that use real-time traffic flow variables measured through a series of loop detectors are the most important component of such systems. A previous crash prediction model was developed with the matched case-control logistic regression technique. Although the model achieved reasonable classification accuracy, it remained open to improvement because of the limited study area, sample size, and transferability issues. Therefore, the previous work had been extended. Multivehicle freeway crashes under high- and low-speed traffic conditions were found to differ in severity and in their mechanism. The distribution of 5-min average speeds obtained immediately before the crash from the loop detector station closest to the crash shows two approximate mound-shaped distributions. This distribution is used as the basis to separate the models for crashes occurring under the two speed conditions. The results show that, as expected, variables that entered in the final models (for crashes under high and low speeds) were not the same. However, they were found to be consistent with the probable mechanisms of crashes under the respective speed conditions. A possible implementation of the separate models with the use of the odds ratios and with the balancing of the threshold between achieving high classification of crash potential and the false alarm situation is presented.