Predicting Freeway Crashes from Loop Detector Data by Matched Case-Control Logistic Regression

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Abstract

Growing concern over traffic safety has led to research into prediction of freeway crashes in an advanced traffic management and information systems environment. A crash likelihood prediction model was developed by using real-time traffic flow variables (measured through a series of underground sensors) potentially associated with crash occurrence. The issues related to real-time application, including range of stations and time slice duration to be examined, were also addressed. The methodology used, matched case-control logistic regression, was adopted from epidemiological studies in which every crash is a case and corresponding noncrashes act as controls. The 5-min average occupancy observed at the upstream station during the 5 to 10 min before the crash, along with the 5-min coefficient of variation in speed at the downstream station during the same time, was found to affect crash occurrence most significantly and hence was used to calculate the corresponding log-odds ratio. A threshold value for this ratio may then be set to determine whether the location must be flagged as a potential crash location. It was shown that by using 1.0 as the threshold for the log-odds ratio, more than 69% crash identification was achieved.