CRASH SEVERITY MODELING IN TRANSPORTATION SYSTEMS

Azad Salim Abdulhafedh

Dr. Timothy Matisziw, Dissertation Supervisor

ABSTRACT

In order to explore potential ways in which crash severity models can be improved to better overcome limitations of traditional modeling approaches that assume all observations are independent of each other, this dissertation develops a detailed framework for detecting temporal and spatial autocorrelation in crash data, evaluates the sight distance available to drivers along roadways, and utilizes a multinomial logistic regression approach to model crash severity. First, to assess existing stopping and decision sight distances on multilane highways, a GIS-based viewshed analysis is developed to identify the locations that do not conform to AASHTO (2011) criteria, and to locate the passing zones and no-passing zones along two-lane highways. Next, to detect the existence of temporal autocorrelation in crash data, this dissertation employs the Durbin-Watson, the Breusch-Godfrey, and the Ljung-Box Q tests, and then describes the removal of any significant amount of temporal autocorrelation using the differencing procedure, and the Cochrane-Orcutt method. Next, to assess whether vehicle crashes are spatially clustered, dispersed, or random, the Moran's *I* and Getis-Ord *Gi** statistics are used as measures of spatial autocorrelation. To incorporate spatial autocorrelation in crash severity modeling, the use of *Gi** statistic as a potential risk factor is explored. Finally, a crash severity model is developed based upon a multinomial logistic regression approach that incorporates the available sight distance and spatial autocorrelation as potential risk factors, in addition to a wide range of other factors related to road geometry, traffic volume, driver's behavior, environment, and vehicles. To demonstrate the characteristics of the proposed model, an analysis of vehicular crashes along I-70 corridor and Boone County roads in the state of Missouri is conducted. The results provide firm evidence on the importance of accounting for spatial and temporal autocorrelation, and sight distance in modeling traffic crash data.