■ 博士學位論文紹介 ■

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(Econometric analysis of the effect of roadway geometric and roadside features on run-off-roadway accident frequencies and severities)

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In the U.S., single-vehicle run-off-roadway accidents result in a million highway crashes with roadside features every year and account for approximately one third of all highway fatalities. Despite of the number and severity of run-off-roadway accidents, quantification of the effect of possible countermeasures has been surprisingly limited due to the absence of data(particularly data on roadside features) needed to rigorously analyze factors affecting the frequency and severity of run-off-roadway accidents. Rigorous statistical modeling approaches have provided important insights into the effects that roadway features have on the frequency and severity of vehicular accidents, but few have addressed roadside features, which influence run-off-roadway accidents experiences. The roadside safety problem is complicated because there are so many variables and external influences, such as changing vehicle fleet, increasing traffic volumes, aggressive driver behavior, right-of-way constraints, infrastructure deterioration, and an aging driver population. This study provides some initial insight into this important problem by combining a number of databases, including a detailed database on roadside features, to analyze run-off-roadway accidents on a 96.6-kilometer section of highway in Washington State. Roadside data were collected with a global positioning system over a period from May 1998 to September 1998. Accumulated route miles were established with GPS and were assigned to each roadside feature that WSDOT collected. These include urban or rural location, degree of slope, and distance to boundary object such as continuous tree group, water, rock wall, building, and other obstructions through which a vehicle could not pass. To quantify the effects of roadside features on accident frequency and severity, statistical models are estimated. For accident frequency analysis, negative binomial and zero-inflated negative binomial models of monthly accident frequency were estimated. This investigation represented an attempt to define the relationships among roadway geometric, roadside characteristics, and run-off-roadway accident frequency. Several conclusions were drawn regarding the effect of roadway geometric and roadside features. Evidence from the results strongly indicated that run-off-roadway accident frequencies can be reduced by increasing lane and shoulder widths; widening medians; expanding the approaches to bridges; shielding, relocating, or removing roadside hazardous objects; and flattening side slopes and median. For accident severity, a nested logit model was estimated. It is important that run-off-roadway

accident severity is a complex interaction of roadside factors. Some variables such as the presence of bridges, guardrails or tree groups contribute to severity as the result of vehicle-object impact whereas others such as the presence of intersections or sign supports appear to mitigate severity, presumably by altering driver behavior in the roadway section. The findings isolate a wide range of factors that significantly influence the frequency and severity of run-off-roadway accidents and provide insight regarding where roadway geometric and roadside objects may or may not be more hazardous. The marginal effects of these factors are computed to provide an indication on the effectiveness on potential countermeasures. Futhermore, this research provides an aid to highway design engineers in determining safe and cost-effective recovery areas. However, the cost for roadside field data collection makes it difficult to develop the quantifiable models for the relationship between roadside-struck objects and run-off-roadway accidents, and there is still much work to be done as the quantity and quality of data sources continue to improve.