This topic is "practice ready." ☐ **Yes** ☒ **No**

Impact of Spatial Pavement Friction on Crash Risk Assessment

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Abstract

Pavement skid resistance affects the safety of vehicle users. Several studies have reported the significant impact of friction loss for wet pavements on fatal accidents rates (McGovern et al. 2011; Merritt et al. 2015; Wong 1990; Zipkes 1977). To quantify the skid resistance of pavement surfaces, standards were developed under two main categories; physical measurements using a skidding test, and indirect estimation through texture measurements. Under the first category, standards include the use of full-scale tire (ASTM E274 / E274M-15), standard rib tire (ASTM E501-08(2015)), and standard smooth tire (ASTM E524-08(2015)). Under the second category some of the approaches are simple such as the sand patch (ASTM E965-15) and outflow meter (ASTM E2380 / E2380M-15) methods. Other approaches collect surface profiles or areal 3D surface geometry that can be used to estimate the macrotexture statistics (Abbas et al. 2007; Zelelew et al. 2014) and the skid resistance accordingly.

Despite the advancements in in quantifying friction from physical or indirect measurements, most practitioners summarize skid resistance by averaging friction numbers over a distance or reporting a moving average skid resistance profile. Until now, there is no well-established methodology to assess the probability of control loss based on the spatial pattern of skid resistance. This study will introduce a

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framework to analyze the risk of a pavement section based on spatial friction measurements. The study will utilize spatial friction measurements to perform stochastic analysis to predict the probability of vehicles losing control over a spatial region. This framework will enable continuous risk maps that depict the crash probability derived from fiction loss for different pavement sections. Describing the friction mechanism and tuning the physical parameters in the model will require experimental data. This study will introduce the theoretical framework through a Bayesian network that probabilistically relates different factors together in order to perform stochastic analysis and assess the risk of friction loss on pavement sections.

Keywords: pavement friction—friction loss—risk analysis—spatial statistics