UTC Project Information

Project Title	MPC-476 – Highway-Rail Grade Crossing Traffic Hazard Forecasting Model
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Project Duration	September 30, 2013 to September 30, 2018
Brief Description of Research Project	Highway-rail grade crossing safety (and the prevention of accidents) is a priority in terms of both highway and railroad safety. Highway-rail crossing accidents often cause severe impacts in terms of fatalities, personal injuries and property damage. The damage cost and disruption to both roads and railroads are often significant (*Evans, A.W., 2011; Salmon, Paul M., 2013*). In 2014, there were 1,873 crashes reported at highway-rail crossings across the U.S., and those accidents resulted 239 deaths and 703 injuries (*Federal Railroad Administration (FRA), 2015*). Concerns about crashes at highway-rail crossings have increased for different agencies because it is commonly agreed that both highway and rail traffic levels increase the occurrence and severity of accidents (*Hu, Shou-Ren, Li, Chin-Shang, and Chi-Kang Lee, 2010; Austin, Ross D, and Jodi L. Carson, 2002*). In results, increasing highway and rail traffic poses a greater risk of crashes at those crossings (*Zhang, Yunlong, Xie, Yuanchang, and Linhua Li. 2012*).

	There are many studies in the academic literature focusing on highway-rail crossing accidents. Most of those studies focus on accident/ severity prediction, accident/severity influencing factors identifications, countermeasures and their effectiveness (*Konur, Dincer, Golias, Mihalis M., and Brandon Darks, 2013; Oh, Jutaek, Washington, Simon P., and Doohee Nam, 2006; Ogden, Brent D. and et al. 2007;* Eluru Naveen and et al, 2012). All of these studies shed light on understanding HRC accidents and provide foundation support for resource allocation for upgrading HRCs safety performance which is critical for the ultimate goal of "zero tolerance" for rail-related accidents/incidents established by FRA. Surprisingly little research has been conducted focusing on resource allocation for HRCs safety improvement, despite the importance of the issue (*Konur, Dincer, Golias, Mihalis M., and Brandon Darks 2013*). Moreover, the studies that focused on the issue often assumed future traffic is greater than current traffic with a certain type of growth rate. However, the detailed traffic at HRCs can fluctuate. Thus, better traffic forecasts need to be implemented in HRC safety upgrade planning. Truck and train traffic are both increasing rapidly at many highway-railroad grade crossings in North Dakota. Much of this traffic is comprised of hazardous materials, including chemicals, fertilizers, crude oil, and other industrial products. The varying and often unpredictable pace of traffic growth poses issues for transportation planning. The number of wells in western North Dakota is predicted to increase five- to seven-fold during the next two decades. As a result, many grade crossings now experiencing modest traffic growth may experience much higher traffic levels in the future. Conversely, traffic may fluctuate and actually drop at some crossings, as drilling activities peak and shift to other parts of the region. Because of fluctuations and shifts in economic activities and traffic demands, trend analysis based on historical traffic counts at grade crossings may not yield valid results. A forecasting model is needed to identify impacted grade crossings in the future—especially those crossings where risks attributable to traffic levels may change dramatically. These forecasts are necessary to understand the scope of the problems that lie ahead.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	All the developed models can be directly served as forecasting model for highway rail grade crossing crash analysis and safety improvement decision making. However, one challenge is the each model has its own pros and cons which make it hard to select one model perform supreme than all the other models. Thus further research to develop an agency user friendly tool based on the modeling techniques is required to

	help implement the advance forecasting models and support HRGC safety improvement decision makings.
Impacts/Benefits of Implementation (actual, not anticipated)	There are two high impact journals already published based on the research contents and findings. Moreover, there are another two journals are under review. All those publications will have higher impact on improving the state-of-art on HRGC safety research.
Web Links • Reports • Project Website	https://www.ugpti.org/resources/reports/details.php?id=914