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Mineta Transportation Institute's free report offers real-time crash risk assessment models

Findings can help traffic management centers create strategies to reduce freeway crashes.

San Jose, Calif., May 3, 2012 – The Mineta Transportation Institute (transweb.sjsu.edu) has released its newest research report, *Proactive Assessment of Accident Risk to Improve Safety on a System of Freeways,* which describes the development and evaluation of real-time crash risk-assessment models based on four California freeway corridors: US Route 101 northbound (NB) and southbound (SB) and Interstate 880 NB and SB. The resulting models can be applied to developing and testing variable speed limits (VSLs) and ramp-metering strategies that proactively attempt to reduce crash risk. Principal investigators were Anurag Pande, PhD, and Cornelius Nuworsoo, PhD, with Cameron Shew. The free report is available for PDF download from transweb.sjsu.edu/project/1006.html

"The research found that the predictive model derived from one freeway can be readily applied to other freeways, although the classification performance decreases," said Dr. Pande. "The models that transfer best to other roadways are those that use the least number of vehicle detection stations – that is, those that use one upstream or downstream station rather than two or three."

The authors have proposed a real-time implementation framework for instant crash risk assessment, but they recommend further study about issuing warnings and drivers' subsequent reactions. These models could also be applied for developing and testing VSL and ramp metering strategies that proactively attempt to reduce crash risk.

In recent years, attention has shifted from reactive (incident detection) to proactive (real-time crash risk assessment) traffic strategies to address freeway traffic safety. Reliable models that can use real-time loop-detector information and distinguish normal flow conditions from crash-prone conditions are keys to implementing crash-preventive measures. This research area has gained increased attention since vehicle detector stations (VDS) on freeways have been able to gather real-time traffic data, and the ability to collect, archive, and analyze these data has grown.

This document advances the current body of knowledge by exploring whether driver characteristics and behavior in close geographic proximity are similar enough to accurately apply the estimated classification models from one roadway segment to another.

The report provides a detailed analysis of several approaches to determine which model would be the most accurate crash predictor. Findings show that:

- Continuous output of the models (posterior probability) can be related to real-time crash risk.
- Both logistic regression and classification tree models can be transferred to nearby roadways, although performance is not as good.
- 3-VDS regression models offer the best classification performance on the same roadway, although 1- and 2-VDS models have superior transferability and are more suitable for real-time application.
- Classification tree models offer comparable performance to logistic regression models.
- There is no appreciable difference between models that consider only daytime crashes and those that consider all crashes.

The complete report includes 14 figures, such as corridor and VDS locations, random generation of non-crash events, arrangement of loop detector stations, and more. The 13 tables include crash details for US 101 NB, best models for all crashes, classification accuracy of classification-tree models, and other tables to illustrate key points. It is available for free download at transweb.sjsu.edu/project/1006.html

ABOUT THE AUTHORS

Anurag Pande, PhD, is an assistant professor of civil engineering at California Polytechnic State University, San Luis Obispo. In addition, he is the coordinator for the dual-degree program in civil engineering and city and regional planning. He is a research associate of the Mineta Transportation Institute.

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ABOUT THE MINETA TRANSPORTATION INSTITUTE

The Mineta Transportation Institute (MTI) conducts research, education, and information and technology transfer, focusing on multimodal surface transportation policy and management issues, especially as they relate to transit. MTI was established by Congress in 1991 as part of the Intermodal Surface Transportation Efficiency Act (ISTEA) and was reauthorized under TEA-21 and again under SAFETEA- LU. The Institute has been funded by Congress through the US Department of Transportation's (DOT) Research and Innovative Technology Administration, by the California Legislature through the Department of Transportation (Caltrans), and by other public and private grants and donations, including grants from the US Department of Homeland Security. DOT selected MTI as a National Center of Excellence following competitions in 2002 and 2006. The internationally respected members of the MTI Board of Trustees represent all major surface transportation modes. MTI's focus on policy and management resulted from the Board's assessment of the transportation industry's unmet needs. That led directly to choosing the San José State University College of Business as the Institute's home. Visit transweb.sjsu.edu or Twitter @minetatrans

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