Evaluation of Real-Time Traffic Monitoring Devices for Texas Hurricane Evacuations

By: Kyle Bathgate, Connie Jiang, Shidong Pan, Jake Robbenstot, Dr. Lu Ku, Dr. Jangsun Sun, Dr. Zhe Han, and Dr. Stephen Boyles.

This project assesses the level of implementation of existing real-time traffic monitoring devices, such as cameras, sensors, and dynamic message signs, to aid with hurricane evacuations in Texas. This poster presents preliminary results from the ongoing study, including survey findings and traffic simulation results to provide TxDOT with recommendations for system upgrades and expansion.

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A Simplified Earned Value Analysis Method for Highway Construction Projects

By: Junghye Son, Nabee Hkawa, Duane S. Milligan, and Brenan D. Honey

The study proposes a simplified method to measure a TxDOT project’s construction progress using earned value (EV) concepts. The methodology relies on readily available contractor progress payment information, eliminating the need for additional data. The data-driven method enhances the project manager’s ability to assess construction performance by providing a more realistic measure of project progress. The methodology can be used by the Area Office or the District Office level to augment the project management function of the Department.

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Pedestrian Crash Frequency: Unpacking the Effects of Contributing Factors and Racial Disparities

By: Angela Haddad, Aupal Mondal, Dr. Chandra Bhat, Angie Zhang, Madison C. Liao, Lisa J. Maceas, Dr. Minh Kyong Law, and Dr. S. Craig Watkins

This study aims to explore the factors influencing pedestrian crashes and racial disparities in their involvement. A multivariate analysis approach is used to unpack the magnitude effects of the determinants of pedestrian crashes. Additionally, the study investigates the reasons for the racial disparities by identifying majority Black (MB) and majority Non-Black (NNB) Census Block Groups (CBGs). The findings of this study can help policymakers and urban planners in developing effective strategies to mitigate pedestrian crashes and address the racial disparities in their occurrence.

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Evacuation Volume and Safety Assessment: A Case Study in Rural Texas Highways during Hurricane Laura on US 90 and US 287

By: Zhe Han, Kyle Bathgate, Connie Jiang, Dr. Michael Murphy, and Dr. Shamin Zhang

In this study, traffic volumes and crash rates during the mandatory evacuation for Hurricane Laura in 2020 were examined using time-series decomposition methods. A case study was performed on two rural Texas highways, and a significant increase in directional traffic volume and a higher number of crashes were observed during the evacuation and post-hurricane return.

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Phantom Queuing in Mopac Express Lanes

By: Shing Fu Kuo, Heidi W. Ross, Kenneth Perrine, and Dr. Natalia Ruiz-Ari

This study aims to investigate the impact of Adaptive Cruise Control (ACC) on Managed Lane (ML) operation and explore the potential causes of the issue “phantom queuing” by studying the effects of Advanced Cruise Control (ACC) on traffic flow and identifying possible mitigations and further areas of study.

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Development of Austin District Driveway Permit Tool

By: Shidong Pan and Dr. Stephen Boyles

TxDOT district engineers review and approve/deny driveway permit applications daily. Area office engineers, traffic, environment, and hydrology reviewers are involved in this process. A user-friendly Microsoft Access-based database tool has been developed to enhance efficiency and streamline this process.

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2023 CTR Symposium Poster Session
Development of An Automated Methodological Procedure to Improve the Identification of Curve-Related Crashes in the Crash Records Information System (CRIS)

By: Dr. Zhe Han, Yang Xu, Dr. Mike Murphy, and Dr. Shuemin Zhang

Horizontal curves can improve the safety and comfort of a ride for drivers and passengers by preventing a sharp turn from one direction to another. There is a need to improve the identification of curve-related crashes in CRIS. This project 1) conducted a thorough literature review to better understand the characteristics of horizontal curves and their impacts on traffic crashes; 2) examined curve-related parameters that can provide meaningful information for the identification of curve-related crashes in the CRIS database; and 3) developed a systematic methodology and prototype to be effective in improving the identification of curve-related crashes in CRIS. Finally, based on the Texas Peace Officer’s Crash Report (CR-3), a thorough investigation was performed to improve our understanding of potential reasons for curve-related crash misclassifications in CRIS.

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Texas Technology Task Force: Supporting the Future of Emerging Mobility Technology in Texas

By: Mark Werner, Andrea Gold, and Dr. Kristie Chin

Launched in 2013 as part of the 89th Texas Legislative session, the Texas Technology Task Force guides TxDOT in developing actionable strategies to advance emerging transportation technologies to meet safety, mobility, and connectivity goals. The Task Force is comprised of dynamic experts representing public agencies, industry, and research institutions. Through quarterly meetings, the Task Force assesses emerging technology barriers and opportunities, develops a series of white papers, and publishes recommendations in an annual Technology Utilization Plan.

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On Modeling Future Workplace Location (WPL) Preferences: An Analysis of Texas Employees

By: Katherine E. Asmussen, Aqpal Mondal, Dr. Chandra R. Bhat, and Dr. Ram M. Pendyala

The COVID-19 pandemic has disrupted employer work patterns. In this poster, we examine employee workplace location (WPL) preferences in an unpredictable and evolving future by investigating how employees would prefer to allocate their monthly working days among the three WPL alternatives of working from home, from the work office, and from a variable third WPL.

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Robotics Based Solution for Understanding Microplastics and their Fate in the Environment

By: Hassan Iqbal and Dr. Christian Claudel

This work proposes mounting raman spectrometers, hyperspectral near IR cameras and macro camera (visible) on autonomous robots that can navigate bays and shallow lakes to accelerate microplastics data acquisition. Ground robots are designed for detecting, counting and classifying microplastics along beaches in real time. The measurement performance is evaluated when sensing the microplastics concentration in the top layer of sediments (classification accuracy, false and true positive rates).

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Evaluation of Geosynthetically-reinforced Asphalt Milling Characteristics and Suitability as Pavement Base Course

By: Ashray Saxena, Natasha Correa, V. Vinay Kumar, and Dr. Jorge G. Zornberg

Due to the possibility of milling asphalt layers that contain geosynthetic interlayers, studies need to be carried out to understand the characteristics and behavior of RAP obtained from geosynthetically-reinforced asphalt, which is referred herein, as GRAP. The results from this investigation indicate that both RAP and GRAP blends with VA exhibited adequate workability and properties, indicating their potential use as pavement base course material.

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Housing Choice in a New Remote Work Landscape

By: Dale Robbenolt, Angela Hadad, Aqpal Mondal, and Dr. Chandra Bhat

The increasing prevalence of remote work during the COVID-19 pandemic has led individuals to reexamine their housing choices and reevaluate the various factors that influence their decisions. With remote work becoming more common, the physical proximity of residence to the in-person workplace may no longer be the primary determinant of residential choice, as it was before the pandemic. Instead, the attributes of the dwelling unit and the characteristics of the neighborhood are becoming increasingly important in determining housing choices. The current study applies residential choice models to account for the shifting factors that influence housing decisions, using a Generalized Heterogeneous Data Model framework to simultaneously model a variety of attitudes, lifestyle preferences, and household sociodemographic characteristics as they affect housing choices.

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Impact of Safety Countermeasures on Dockless E-Scooter Crashes

By: Jennifer Hall and Dr. Randy Machemehl

Although they’re relatively new, e-scooters have already become deeply rooted into the transportation system as a solution to last-mile trips. Previous research has shown that majority of e-scooter related crashes occur along the street and sidewalk, and typically are caused by users falling off, or colliding with a vehicle. Solutions toward curbing accident rates including geofencing technologies, parking restrictions, and impoundment fees. This paper reveals that parking restrictions, paired with the impoundment fees is significant in reducing e-scooter related accidents in Austin, TX.

Presenter: Jennifer Hall
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Optimizing Geometric Configurations of Rumble Strip - Retractable Pavement Markers (RPM) Inset to Improve Visibility after Winter Weather Operations

By: Md Al Amin, Dr. Sawitha Srunvase, Dr. Raisa Ferron, and Michael Rung

Research Project 0-6955 found that RPMs placed in rumble strips are an effective way to protect RPMs from excessive wear. The implementation project (8-4955-01) is examining the performance of RPM-Rumble Strip Inset by putting RPMs in six highway stretches in northern Texas. The study’s findings include standardized geometric configurations to transfer RPM loss and nighttime visibility of the roadway centerline.

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Analysis and Evaluation of Texas’ Twin-Tub Girder Bridges for System Redundancy

By: Loveleen, Xiaoyi Chen, Sunghyun Park, and Jeonghwa Lee

Texas has around 500 steel twin-tub girder bridges. As per AASHTO guidelines, these bridges are considered non-redundant, and millions of dollars are spent on their hands-on inspections each year posing increased safety concerns. This research analyzes existing twin-tub girder bridges in Texas to demonstrate redundancy and identify a criterion that TxDOT can adopt to exempt these bridges from rigorous inspections.

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A Disassonance Study of Employees’ Current and Preferred Workplace Locations

By: Samantha Anderson, Katherine Asmussen, and Dr. Chandra Bhat

The purpose of this study is to investigate the COVID-19 effect on workplace location dissonance (i.e., the difference between how an employee currently works remotely and how frequently the employee would like to work remotely if the choice were completely up to them). The findings from this study can provide important insights regarding how best to balance employee and employer preferences to improve overall workplace and life satisfaction. Additionally, this study can contribute to future transportation and land-use policy-making.

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Exploring the Use of Artificial Intelligence to Leverage TxDOT Data for Enhanced Corridor Management

By: Kenneth Perrine, Natalia Ruiz-Juri, Dr. Stephen Boyles, Kristine Chin, Andrew Gold, and William Alexander

This project is developing machine learning models to predict expected travel times on freeway corridors in real-time. The models are fed inputs travel time data provided by WRIIX and traffic volume information where available. CTR has developed data pipelines, a database schema, and automated workflows to support model deployment. There are currently four trained models, two in Austin and two in El Paso, for which real-time results may be visualized and analyzed via a web-based application.

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Transportation Infrastructure Maintenance and Rehabilitation Master Planning Tools

By: Stefanos Politis, Dr. Zhe Han, Dr. Liang Liang, Miguel Andrade, Dr. Michael Murphy, and Dr. Zhenmin Zhang

Performance-based tools have been developed for the efficient planning and allocation of budget to transportation infrastructure assets. Deterioration models are calibrated, drawing data from the Pavement Management Information System (PMIS) and the National Bridge Inventory (NBI). Markov chain simulation and genetic algorithms are employed to predict future needs and provide optimal solutions for different allocation scenarios.

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Evaluate Nanomaterials in Concrete for Improved Durability

By: Hajilia Njenga, Hwaan Lee, Dr. Santana Smirnova, Michael Rung, Dr. Berken Dordt-Kwiek, and Dr. Raissia Ferron

The impact of nanomaterials on the durability properties of concrete mixtures is being evaluated in this research work. The goal of the project is to determine optimum dosage ranges for nanomaterials and establish guidelines for effective incorporation of nanomaterials in concrete.

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Improving Roadway Flooding Estimates with Real-Time Data Assimilation

By: Jeff Oh, Dr. Matt Bartos, Dr. Paola Passalacqua, and Dr. David Madiman

Real-time assimilation of water depth data based on Kalman filter enables the estimation of discharge and associated levels of uncertainty at gauges and improves the flood estimates in near real-time. The network real-time data assimilation combined with National Water Model (NWM) results in improved flood forecasting, providing timely alerts for transportation systems during stormwater events.

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Error Analysis of Streamflow Forecasts from the National Water Model and Validation of Data Assimilation Approaches

By: Sujana Timilshina, and Dr. Paola Passalacqua

Error analysis of the streamflow forecasts from the National Water Model (NWM) provides an insight to the performance of the National Water Model throughout Texas. The error analysis is used to explore the possible improvements in the streamflow predictions through error and uncertainty maps as well as the improvement in the NWM Data Assimilation technique.

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Assess HERO Incident Management Programs in Austin, El Paso, and San Antonio Metropolitan Areas: Current Progress

By: Dr. Zhe Han, Yang Xu, Dr. Abhe Murphy, and Dr. Zhenmin Zhang

The Highway Emergency Response Operator (HERO) program was established in Texas DOT Austin District through a collaboration with other transportation agencies in 2010 to aid in clearance of minor crashes from roadways and to aid motorists in need of assistance. Following the public’s positive response, more districts instituted HERO programs in recent years. The objective of this project is to conduct a systematic assessment of the overall effectiveness of HERO programs in Austin, El Paso, and San Antonio.

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