# Transportation Research Record: Journal of the Transportation Research Board

Volume 2676, Issue 6

June 2022

ISBN: 978-1-7138-5915-4

#### Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Published by Sage Publications USA

Copyright© (2022) by Transportation Research Board of the National Academies All rights reserved.

ISBN (Print) 978-1-7138-5915-4

Printed with permission by Curran Associates, Inc. (2022)

For permission requests, please contact sagepub.com/journals-permissions

#### Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400

Phone: 845-758-0400 Fax: 845-758-2633

Email: curran@proceedings.com Web: www.proceedings.com



## **Contents**

### **Research Articles**

Approach to Determination of Risk-Based Inspection Workload for Highway Construction Projects  Mamdouh Mohamed and Daniel Tran	I
Evaluation of Hexagonal Multi-Shape, Multi-Axial Geogrids in Unsurfaced Road Applications William Jeremy Robinson, Mark H. Wayne, and Prajwol Tamrakar	13
Experimental Investigation of Piezoelectric Energy Harvesters Applied in Concrete Pavement Chenchen Li, Hongduo Zhao, Yu Tian, and Zhongpu Lin	25
Modeling Injury Severity of Unconventional Vehicle Occupants: Hybrid of Latent Segments and Random Parameters Logit Models  Bijoy Saha, Mahmudur Rahman Fatmi, and Md. Mizanur Rahman	35
Using Probe-Based Speed Data and Interactive Maps for Long-Term and COVID-Era Congestion Monitoring in San Francisco Bhargava Sana, Xu Zhang, Joe Castiglione, Mei Chen, and Gregory D. Erhardt	48
Operational and Safety Performance Evaluation of Parallel Flow Intersection Salma Abo-Bakr, Mohamed El Esawey, and Ahmed Osama	61
Evaluating the Potential Environmental Benefits of Cold Recycling-Based Methods for Flexible Pavement Rehabilitation in Virginia  Eugene Annan Amarh, Joao Santos, Gerardo W. Flintsch, and Brian K. Diefenderfer	75
Level of Pedestrian Stress in Urban Streetscapes Alvaro Rodriguez-Valencia, Hernan Alberto Ortiz-Ramirez, Willis Simancas, and Jose Agustin Vallejo-Borda	87
Near Surface Pavement Response Using a Numerically Approximated Tire Contact Pressure From Inverse Analysis  Jeremiah Stache	99
Performance Evaluation of Modified Cyclic Max-Pressure Controlled Intersections in Realistic Corridors Simanta Barman and Michael W. Levin	110
Research on Characteristics of Macrotexture for Colored Anti-Skid Coating on Pavement Based on Fractal Theory Kaifeng Wang, Yue Li, Yunsheng Zhu, Huilun Xiang, and Genqi Lu	129
Generational Patterns of Modal Shares Across Megaregions  Yang Li and Ming Zhang	141
Order-Dispatching Strategy Induced by Optimal Transport Plan for an Online Ride-Hailing System Dechao Lei and Yuanshan Wu	156
Application of Sieve Analysis to Estimate Recycled Binder Availability  Sonja Pape and Cassie Castorena	170

Development of a Smartphone Application Serving Pavement Management Engineers  Damien Stephens, Mena I. Souliman, Matthew Vechione, Mukul Shirvaikar, and Yi Li	182
Using General Transit Feed Specification-Ride to Identify Riders' Use of Transfer Opportunities Sylvan Hoover, Austin Kost, and J. David Porter	197
Multistate Pilot Study Evaluating the Short-Term Efficacy of a Smartphone-Based Older Driver Support System on Modifying Risky Driving Behaviors Nichole L. Morris, Disi Tian, David A. Libby, and Curtis M. Craig	207
Real-Time Arterial-Friendly Ramp Metering System Yao Cheng, Yen-Yu Chen, and Gang-Len Chang	217
Efficient Histogram-Based Gradient Boosting Approach for Accident Severity Prediction With Multisource Data Mohammad Tamim Kashifi and Irfan Ahmad	236
BIM–LCCA Integration for Road Pavement Maintenance Cristina Oreto, Salvatore Antonio Biancardo, Rosa Veropalumbo, Nunzio Viscione, Francesca Russo, and Gianluca Dell'Acqua	259
Development of Cost-Effective High-Modulus Asphalt Concrete Mixtures Using Crumb Rubber and Local Construction Materials in Louisiana  Ibrahim Elnaml, Momen Mousa, Marwa M. Hassan, Ipshit Idris, and Louay Mohammad	274
Evaluation of Alternative Sources of Supplementary Cementitious Materials for Concrete Materials Sujata Subedi, Gabriel A. Arce, Marwa M. Hassan, Oscar Huang, Miladin Radovic, and Zahid Hossain	287
Evaluation of Recycling Agent and Extender Dosage Selection Procedures to Restore the High-Temperature Climatic Performance Grade  Andrew Fried, Lei Gabriel Xue, Saqib Gulzar, Jaime Preciado, B. Shane Underwood, and Cassie Castorena	302
Fast-Spherical-Projection-Based Point Cloud Clustering Algorithm Zhihui Chen, Hao Xu, Junxuan Zhao, and Hongchao Liu	315
Fuel-Optimal Aircraft Arrival Operations in Extended Terminal Maneuvering Areas  Ramazan Kursat Cecen	330
Impact of Automated Mobility-On-Demand on Weekly Activity Patterns: A Study of Singapore Karina Hermawan, Ravi Seshadri, Takanori Sakai, P. Christopher Zegras, and Moshe Ben-Akiva	340
Short-Term Travel-Time Prediction using Support Vector Machine and Nearest Neighbor Method Meng Meng, Trinh Dinh Toan, Yiik Diew Wong, and Soi Hoi Lam	353
Ultra-Long-Distance High-Speed Railways Night Trains Operations: Differentiation Mode Mohamed Alhossein and Qiyuan Peng	366
Using Ground Penetrating Radar to Monitor Seasonal Moisture Fluctuations in Base Layers of Existing Roads  Eyoab Zegeye-Teshale, Micah Holzbauer, and Shongtao Dai	371
When and Where to Go Next: Deep Learning Framework for Modeling Drivers' Behaviors Using Automatic Vehicle Identification Data  Kun Jin, Xinran Li, Wei Wang, XueDong Hua, and Shaoyang Qin	387
Effect of Process Control Parameters on the Workability and Strength Characteristics of Microsurfacing Mix Nishant Bhargava, Anjan Kumar Siddagangaiah, and Teiborlang Lyngdoh Ryntathiang	399
Examination of Current MASH Occupant Compartment Intrusion Limits Using Real-World Crash Data Douglas J. Gabauer and Suphanat Juengprasertsak	413

Studying Two-Wheeler Usage in the Context of Sustainable and Resilient Urban Mobility Policies in India Jaishree Jindel, Aitichya Chandra, Hemanthini Allirani, and Ashish Verma	424
Data and Modeling Support of the Management of Diversion Routes During Freeway Incidents Mosammat Tahnin Tariq, Rajib Saha, and Mohammed Hadi	437
Detecting Anomalies in National Bridge Inventory Databases Using Machine Learning Methods Ehsan Fereshtehnejad, Gianluca Gazzola, Pratik Parekh, Chirag Nakrani, and Hooman Parvardeh	453
Evaluation of Maintenance Procedures for Bridge Spalling on Parapet Walls Richard A. Miller, Norbert J. Delatte, Abhijeet Deshpande, Julie Ann Hartell, Sarah Twine, and Evan Karunaratne	468
Evaluation of Pavement Treatment Strategies for Friction-Deficient Horizontal Curves  Jia Peng, Longjia Chu, Yuanyuan Liu, and T. F. Fwa	476
Operational Impact of Microcars on Urban and Suburban Road Corridors Hesham El Masry, Mohamed El Esawey, Khaled El-Araby, and Ahmed Osama	488
Soil Loss Risk Analysis for Construction Activities Billur Kazaz, Jaime C. Schussler, Loulou C. Dickey, and Michael A. Perez	503
Developing Enhanced Unmanned Aerial Vehicle Sensing System for Practical Bridge Inspections Using Field Experiments Roya Nasimi, Fernando Moreu, Mitra Nasimi, and Richard Wood	514
Modeling the Effects of Asphalt Overlay Design on Pavement Distress Initiation with Random Parameters Hazard-Based Duration Models  Chunfu Xin, Qing Lu, and Hong Zhang	523
Modeling Thermal Behavior of Mass Concrete Structures at Early Age Tahsin Alper Yikici, Hayri Sezer, and Hung-Liang (Roger) Chen	536
Nonlinear Model-Based Subway Station-Level Peak-Hour Ridership Estimation Approach in the Context of Peak Deviation  Jie Wei, Yanqiu Cheng, Kuanmin Chen, Meng Wang, Chen Ma, and Xianbiao Hu	549
Prediction of Shear Wave Velocity in Fine-grained Soils From Cone Penetration Test Data: Toward a Global Approach  Ahmad Mousa and Mohab Hussein	565
Testing Connected Vehicle-Based Accident Mitigation for Red-Light Violation Using Simulation Strategies Mehrdad Tajalli, S. M. A. Bin Al Islam, George F. List, and Ali Hajbabaie	583
Influence of Fixing Feet in Rear-End Crashes Abbas Talimian, Jan Vychytil, and Luděk Hynčík	601
Use of Low-Activity Nuclear Density Gauge in Iron Oxide-Rich Soils  Elizabeth N. Londynsky and Phillip S. K. Ooi	615
Using Global Positioning System Big Data to Define a Bikeshare User Typology and Model On-/Off-Road Bicycle Facility Preferences Benjamin Burmester and Jeffrey J. LaMondia	626
Study of the Potential Effects of Gate-Hold Strategies on Arrival and Departure Operations at Charlotte Douglas International Airport  Laurence Douglas Smith and Canser Bilir	640

Applying Association Rules Mining to Investigate Pedestrian Fatal and Injury Crash Patterns Under Different Lighting Conditions  Ahmed Hossain, Xiaoduan Sun, Raju Thapa, and Julius Codjoe	659
Commuting Carless: A Qualitative Study of Transportation Challenges for Disadvantaged Job Seekers in Chicago, IL  Chelsie Coren, Kate Lowe, and Jesus M. Barajas	673
Evaluation of Posted Speed Limits Reductions on Urban Roads with a High Percentage of Cyclists Jaclyn S. Schaefer, Miguel A. Figliozzi, and Avinash Unnikrishnan	685
Implementation of NCHRP 9-44A Fatigue Endurance Limit Prediction Model in Mechanistic-Empirical Asphalt Pavement Analysis Web Application  Mahdi Ghazavi, Seyed Farhad Abdollahi, and M. Emin Kutay	696
Modeling Pedestrian Temporal Violations at Signalized Crosswalks: A Random Intercept Parametric Survival Model  Yan Liu, Rushdi Alsaleh, and Tarek Sayed	707
Pavement Management Programs Based on Quantitative Performance Targets  Muhammad Arif Beg	721
Quantifying the Extent to Which Connected and Autonomous Vehicles Reduce Accidents at Railroad Grade Crossings: A Machine Learning Approach  Jacob Mathew and Rahim F. Benekohal	731
Toward Explainable Artificial Intelligence for Early Anticipation of Traffic Accidents  Muhammad Monjurul Karim, Yu Li, and Ruwen Qin	743
Variable Speed Limit Control with Dynamic Location of Message Signs for the Internet-of-Vehicles Environment Jiajie Hou, Minghui Ma, and Jiacheng Xiao	756
Alternative Horizontal Markings along Curved Exit Ramp Terminals to Improve Driver-Safety-Related Performance  Giorgia Raimondo, Alessandra Lioi, Abrar Hazoor, Alberto Portera, Luca Tefa, and Marco Bassani	774
Correlation of Electrical Resistivity and Formation Factor with Chloride and Water Permeability of Recycled Aggregate Concrete  Ariel Miguel Aragoncillo and Gilson Lomboy	788
Heterogeneity in Personal Attitudes and Preferences for High-Speed Metropolitan Railway Service by Travel Contexts in South Korea: A Hybrid Choice Modeling Approach Jaehyeong Kong, Sugyo Jeong, Jaewoong Yun, Jin-Hyuk Chung, and Jinhee Kim	797
Opportunities and Barriers for Truck Platooning on Norwegian Rural Freight Routes  Maren Helene Rø Eitrheim, Markus Metallinos Log, Trude Tørset, Tomas Levin, and Kelly Pitera	810