Transportation Research Record: Journal of the Transportation Research Board

Volume 2675, Issue 10

October 2021

Part 1 of 2

ISBN: 978-1-7138-3949-1

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© (2021) by Transportation Research Board of the National Academies All rights reserved.

ISBN (Print) 978-1-7138-3949-1

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

2020 Fred Burggraf Award: Outstanding Paper by a Young Author in Aviation

Modeling Arrival Flight Times within the Terminal Airspace Osama Alsalous and Susan Hotle	I
Research Articles	
Using 3D Rule-Based Modeling to Interactively Visualize "Complete Streets" Design Scenarios Ilir Bejleri, Soowoong Noh, Jamie N. Bufkin, Ruchen Zhou, and David Wasserman	14
Potential Crash Rate Benchmarks for Automated Vehicles Noah J. Goodall	31
Vision for Mechanistic-Empirical Railway Track System and Component Analysis and Design J. Riley Edwards, Ricardo J. Quirós-Orozco, Josué César Bastos, Marcus S. Dersch, and Erol Tutumluer	41
Dynamically Collected Local Density using Low-Cost Lidar and its Application to Traffic Models Azhagan Avr, Shams Tanvir, Nagui M. Rouphail, and Ishtiak Ahmed	56
Examining Driver Injury Severity in Single-Vehicle Road Departure Crashes Involving Large Trucks Mehdi Hosseinpour and Kirolos Haleem	68
Household Transportation Energy Affordability by Region and Socioeconomic Factors Yan Zhou, Spencer Aeschliman, and David Gohlke	81
Investigation of Surrogate Performance Related Tests for Fatigue Cracking of Asphalt Pavements Liya Jiao, John T. Harvey, Mohamed Elkashef, Yanlong Liang, and David Jones	96
Measuring Pedestrian Level of Stress in Urban Environments: Naturalistic Walking Pilot Study Seth LaJeunesse, Paul Ryus, Wesley Kumfer, Sirisha Kothuri, and Krista Nordback	109
Virus Transmission Risk in Urban Rail Systems: Microscopic Simulation-Based Analysis of Spatio-Temporal Characteristics Jiali Zhou and Haris N. Koutsopoulos	120
Investigating Head-On Crash Severity Involving Commercial Motor Vehicles in Kentucky James Smith, Mehdi Hosseinpour, Ryan Mains, Nathanael Hummel, and Kirolos Haleem	133
Long-Distance Airport Substitution and Air Market Leakage: Empirical Investigations in the U.S. Midwest Kaleab Woldeyohannes Yirgu, Amy M. Kim, and Megan S. Ryerson	148
Reliability-Based Assessment of Potential Risk for Lane-Changing Maneuvers Yang-Jun Joo, Ho-Chul Park, Seung-Young Kho, and Dong-Kyu Kim	161
Risk to Bicyclists in a Separated Path from Left Turns across Multiple Lanes: A Case for Protected-Only Left Turns Ray Saeidi Razavi and Peter G. Furth	174

Vehicle Dimensions Based Passenger Car Classification using Fuzzy and Non-Fuzzy Clustering Methods Naghmeh Niroomand, Christian Bach, and Miriam Elser	184
Assessment of Arterial Signal Timings Based on Various Operational Policies and Optimization Tools Suhaib Al Shayeb, Nemanja Dobrota, Aleksandar Stevanovic, and Nikola Mitrovic	195
DistTune: Distributed Fine-Grained Adaptive Traffic Speed Prediction for Growing Transportation Networks Ming-Chang Lee, Jia-Chun Lin, and Ernst Gunnar Gran	211
Age Groups	228
Hatem Abou-Senna, Mohamed El-Agroudy, Mustapha Mouloua, and Essam Radwan	241
Human Factors Assessment of Pavement Marking Retroreflectivity in Simulated Rain and Dry Conditions Timothy P. Barrette and Adam M. Pike	241
Lane-Change Gaming Decision Control Based on Multiple Targets Evaluation for Autonomous Vehicle Yangyang Wang, Hangyun Deng, and Guangda Chen	254
Preserving Privacy with Federated Learning in Route Choice Behavior Modeling Yonghyeon Kweon, Bingrong Sun, and B. Brian Park	268
Prioritizing Pedestrian and Bicyclist Count Locations for Volume Estimation Jessica Schoner, Frank Proulx, Katherine Knapp de Orvañanos, and Brian Almdale	277
Synchronized Entry-Traffic Flow Prediction for Regional Expressway System Based on Multidimensional Tensor Hong Gao, Zengjie Wang, Zhenjun Yan, Zhaoyuan Yu, Wen Luo, and Linwang Yuan	291
Balancing the Service Benefits and Mainline Delay Disbenefits of Operating Shorter Freight Trains Adrian Diaz de Rivera, C. Tyler Dick, and Matthew M. Parkes	303
Deploying and Integrating Smart Devices to Improve Work Zone Data for Work Zone Data Exchange Skylar Knickerbocker, Varsha Ravichandra-Mouli, and Archana Venkatachalapathy	317
Drivers Still Have Limited Knowledge About Adaptive Cruise Control Even When They Own the System Chelsea A. DeGuzman and Birsen Donmez	328
Florida Department of Transportation's Enhanced Hydroplaning Prediction Tool Hyung Suk Lee, Mateo Carvajal, Charles Holzschuher, and Bouzid Choubane	340
Impact of Cooperative Adaptive Cruise Control on a Multilane Highway under a Differentiated Per-Lane Speed Limit Policy Zhe Xiao, Xiaoyu Guo, Xiucheng Guo, and Yi Li	353
	367
with Permissive Indication Boris Claros, Madhav Chitturi, Andrea Bill, and David A. Noyce	307
and Dense-Graded Mixtures	381
Punyaslok Rath, Hamed Majidifard, Behnam Jahangiri, Shishi Chen, and William G. Buttlar	
Multi-Objective Evaluation Model of Single-Lane Roundabouts Hend Ahmed and Said M. Easa	395
Precision Scheduled Railroading and the Need for Improved Estimates of Yard Capacity and Performance Considering Traffic Complexity C. Tyler Dick	411

Evaluating Changes in Spatial Accessibility to Airports in Turkey between 2000 and 2018 Muhammed Ziya Paköz and Adem Sakarya	425
Exploratory Evaluation of a Concept Combining Incentivized On-Demand Ridesharing with Congestion Pricing Patrick DeCorla-Souza	440
Identification of Optimal Left-Turn Restriction Locations using Heuristic Methods Murat Bayrak and Vikash V. Gayah	452
Integrated Herfindahl–Hirschman Index, Compromise Programming, and ε-Constraint Method For Multicriteria Performance-Based Transportation Budget Allocation Tung Q. Truong, Ji Zhang, Zongzhi Li, and Lu Wang	468
MAP-21 to FAST Act: Did the Transportation Infrastructure Finance and Innovation Act Program Better Support High- Risk Transportation Infrastructure Projects? Narae Lee and Jonathan L. Gifford	481
Performance Evaluation of Asphalt Mixtures Modified with Recycled Polyethylene via the Wet Process Fan Yin, Mawazo Fortunatus, Raquel Moraes, Michael D. Elwardany, Nam Tran, and Jean-Pascal Planche	491
Speeds of Right-Turning Vehicles at Signalized Intersections during Green or Yellow Phase Kay Fitzpatrick, Michael P. Pratt, and Raul Avelar	503
Strain Sweep Fatigue Testing of Sand Asphalt Mortar to Investigate the Effects of Sample Geometry, Binder Film Thickness, and Testing Temperature Lilian Ribeiro de Rezende, Santosh Reddy Kommidi, Yong-Rak Kim, and Mahdieh Khedmati	516
Use of Bivariate Random-Parameter Probit Model to Analyze the Injury Severity of Highway Traffic Crashes Involving School-Age Children Jaeyoung Lee, Suyi Mao, Mohamed Abdel-Aty, and Wen Fu	530
Development of a Multi-Distress Detection System for Asphalt Pavements: Transfer Learning-Based Approach Naga Siva Pavani Peraka, Krishna Prapoorna Biligiri, and Satyanarayana N. Kalidindi	538
Enhancing the Accuracy of Peak Hourly Demand in Bike-Sharing Systems using a Graph Convolutional Network with Public Transit Usage Data Jung-Hoon Cho, Seung Woo Ham, and Dong-Kyu Kim	554
Improving Interstate Freeway Travel Time Reliability Analysis by Clustering Travel Time Distributions Xiaoxiao Zhang, Mo Zhao, Justice Appiah, and Michael D. Fontaine	566
Kalman Filtering Method for Real-Time Queue Length Estimation in a Connected Vehicle Environment Yi Wang, Zhihong Yao, Yang Cheng, Yangsheng Jiang, and Bin Ran	578
Network Optimization of Railway Cold Chain Logistics Based on Freight Subsidy Yu Lu, Xingfang Xu, Chuanzhong Yin, and Yueyi Zhang	590
Passenger Expectations and Airport Service Quality: Exploring Customer Segmentation George Christian Linhares Bezerra, Eliézer Mello de Souza, and Anderson Ribeiro Correia	604
Peer Review: The Volpe/Federal Highway Administration National Vehicle Miles Traveled Forecasting Models Jeffrey Cohen, Sharada Vadali, Michael F. Lawrence, Shikha Dave, and Clayton Clark	616
Unsaturated Hydraulic Conductivity Variation of Expansive Yazoo Clay with Wet-Dry Cycles John Ivoke, Mohammad Sadik Khan, and Masoud Nobahar	629
Application of a Tax to E-Commerce Deliveries in Barcelona Genís Majoral, Francesc Gasbarín, and Sergi Saurí	642

Do We Need a Change in Road Winter Maintenance to Accommodate for Automated Vehicles? A State-of-the-Art Literature Review Considering Automated Vehicle Technology's Usage of Road Infrastructure During Winter Ingvild Ødegård and Alex Klein-Paste	656
Impact of Non-Aeronautical Revenues on Airport Landing Charge in Global Airports Taejin Shin and Taewoo Roh	667
Potential Benefits of Animal-Detecting Automatic Emergency Braking Systems Based on U.S. Driving Data Jeremy A. Decker, Samantha H. Haus, Rini Sherony, and Hampton C. Gabler	678
System Dynamics Modeling for a Public-Private Partnership Program to Promote Bicycle-Metro Integration Based on Evolutionary Game Jianming Cai and Yue Liang	689
Transit Users' Mode Choice Behavior During Light Rail Transit Short-Term Planned Service Disruption Muhammad Arslan Asim, Adam Weiss, Lina Kattan, and S. C. Wirasinghe	711
Using Traffic Disturbance Metrics to Estimate and Predict Freeway Traffic Breakdown and Safety Events Leila Azizi and Mohammed Hadi	723
Effects of Occupational Drivers' Traffic Accident History on Risk Perception, Work Attitudes, and Unstable Driving Eun Kyoung Chung, So Young Park, and Young Woo Sohn	734
Machine Learning Solutions for Bridge Scour Forecast Based on Monitoring Data Negin Yousefpour, Steve Downie, Steve Walker, Nathan Perkins, and Hristo Dikanski	745
Performance Evaluation of Stabilized Base Course using Asphalt Emulsion and Asphaltenes Derived from Alberta Oil Sands Farshad Kamran, Manjunath Basavarajappa, Nura Bala, and Leila Hashemian	764
Simulation of the Impacts of a Zero-Emission Zone on Freight Delivery Patterns in Rotterdam Michiel de Bok, Lóránt Tavasszy, Ioanna Kourounioti, Sebastiaan Thoen, Larissa Eggers, Victor Mayland Nielsen, and Jos Streng	776
Assessing Climate Change Impact on Asphalt Binder Grade Selection and its Implications Surya T. Swarna, Kamal Hossain, Harshdutta Pandya, and Yusuf A. Mehta	786
Effects of Connectivity and Traffic Observability on an Adaptive Traffic Signal Control System S M A Bin Al Islam, Mehrdad Tajalli, Rasool Mohebifard, and Ali Hajbabaie	800
Identification of Potential Freight Parking Locations in Urban Areas Glenn Vorhes, Ernest Perry, and Soyoung Ahn	815
Investigating the Preferences of Local Residents toward a Proposed Bus Network Redesign in Chattanooga, Tennessee Abubakr Ziedan, Cassidy Crossland, Candace Brakewood, Philip Pugliese, and Harrison Ooi	825
Multi-Objective Optimization for Skip-Stop Strategy Based on Smartcard Data Considering Total Travel Time and Equity Sang-Wook Han, Eun Hak Lee, and Dong-Kyu Kim	841
Secondary Crash Identification using Crowdsourced Waze User Reports Zhihua Zhang, Yuandong Liu, Lee D. Han, and Phillip Bradley Freeze	853
Topological-Based Measures with Flow Attributes to Identify Critical Links in a Transportation Network Hana Takhtfiroozeh, Mihalis Golias, and Sabyasachee Mishra	863

Analysis of the Integration Usage Patterns of Multiple Shared Mobility Modes and Metro System Hui Bi, Zhirui Ye, and Yi Zhang	876
Automatic Traffic Queue-End Identification using Location-Based Waze User Reports Yuandong Liu, Zhihua Zhang, Lee D. Han, and Candace Brakewood	895
Exploration of Maximum-to-Minimum Shifts in Generic Methods for Departure Time Choice Models Amit Daly and Hillel Bar-Gera	907
Case Study of Social Sustainability Practices in U.S. Small Hub Airports Caroline K. Marete and Mary E. Johnson	916
Eco-Drive Technology, Human Factors, and Environmental and Economic Benefits Ata M. Khan, Greg Kent, and Omar Choudhry	927
Non-Destructive Detection of Asphalt Concrete Stripping Damage using Ground Penetrating Radar Ye Ma, Mostafa A. Elseifi, Nirmal Dhakal, Mohammad Z. Bashar, and Zhongjie Zhang	938
Path-Based Dynamic Vehicle Dispatch Strategy for Demand Responsive Transit Systems Shiyu Shen, Yanfeng Ouyang, Shuai Ren, and Luyun Zhao	948
Understanding Fatal Crash Reporting Patterns in Bangladeshi Online Media using Text Mining Subasish Das	960
Approaches and Barriers to Addressing Equity in Transportation: Experiences of Transportation Practitioners Kaylla Cantilina, Shanna R. Daly, Matthew P. Reed, and Robert C. Hampshire	972
Evaluation of the Effect of Aircraft Tire Inflation Pressure on Thin Asphalt Pavements W. Jeremy Robinson	986
Household Evacuation Planning and Preparation for Future Hurricanes: Role of Utility Service Disruptions Nafisa Halim, Fan Jiang, Mohammad Khan, Sisi Meng, and Pallab Mozumder	1000
Impact of Specialized Hauling Vehicles and Emergency Vehicles on Bridge Load Rating Peng Lou, Chan Yang, and Hani Nassif	1012
Incorporating Flood Hazards into Pavement Sustainability Assessment Jessica Achebe, Oluremi Oyediji, Rebecca K. Saari, Susan Tighe, and Filzah Nasir	1025
Market-Segmentation Study of Future and Potential Users of the New Réseau Express Métropolitain Light Rail in Montreal, Canada	1043
Nicolette Dent, Leila Hawa, James DeWeese, Rania Wasfi, Yan Kestens, and Ahmed El-Geneidy	
Performance-Based Approach for Deciding the Age of New Concrete for Thin Epoxy Overlay Application Upul Attanayake and Abul Fazal Mazumder	1055
Revisiting Transit-Oriented Development Evaluation for Urban Master Plans in the Context of Developing Countries Minoo Harirchian, Mahya Azadi, Shahab Kermanshahi, Mahdi Bashirinia, and Milad Ghasri	1069
Survey of Work Zone Practices and Validation of Highway Capacity Manual Work Zone Capacity Model Raju Thapa, Julius Codjoe, and Amanua Osafo	1083
Capacitated Location-Allocation-Routing Problem with Time Windows for On-Demand Urban Air Taxi Operation Haleh Ale-Ahmad and Hani S. Mahmassani	1092
	_
Development of a Non-Gating Guardrail Terminal Kevin D. Schrum, Kenneth Walls, Joseph Schwertz, Blake Feltman, Dakotah Sicking, and Dean L. Sicking	1115

Development of a Performance-Related Framework for Asphalt Mixture Design for the Illinois Tollway Behnam Jahangiri, Punyaslok Rath, Hamed Majidifard, and William G. Buttlar	1127
Driving While Impaired and Riding with an Impaired Driver among Recent Latinx Immigrants Eduardo Romano, Mariana Sanchez, Eileen P. Taylor, and Rosa Babino	1140
Experimental Study on the Relationship between Fatigue and Unsafe Behavior of Urban Rail Transit Drivers Xing-da You, Lin Zhu, Zhi-gang Liu, and Yuan-chun Huang	1151
Impact of Concrete Mix Ingredients and Surface Treatments on Epoxy Overlay Performance Abul Fazal Mazumder, Harsha Amunugama, and Upul Attanayake	1161
Impact of One-Way Streets and Contraflow on Low-Stress Bicycle Network Connectivity Theja Putta and Peter G. Furth	1174
Implementation Sequence Optimization for Dedicated Bus Lane Projects Murat Bayrak, S. Ilgin Guler, and Paul Schonfeld	1184
Analysis of Headway and Speed Based on Driver Characteristics and Work Zone Configurations Using Naturalistic Driving Study Data Dan Xu, Chennan Xue, and Huaguo Zhou	1196
Assessment of Queue Warning Application on Signalized Intersections for Connected Freight Vehicles Sara Bashir and Milan Zlatkovic	1211
Big Data Insights into Container Vessel Dwell Times Daniel Smith	1222
Driver Response to a Dynamic Speed Feedback Sign on Freeway Exit Ramps Based on Sign Location, Interchange Type, and Time of Day Md Shakir Mahmud, Matthew Motz, Travis Holpuch, Jordan Hankin, Anthony J. Ingle, Timothy J. Gates, and Peter T. Savolainen	1236
Empirical Estimation of Shortest Route Length along U.S. Interstate Highways Based on Great Circle Distance Nawei Liu, Fei Xie, Zhenhong Lin, and Mingzhou Jin	1248
Exploratory Study of Flexural Performance of Mechanically Recycled Glass Fiber Reinforced Polymer Shreds as Reinforcement in Cement Mortar Md Mostofa Haider, Somayeh Nassiri, Karl Englund, Hui Li, and Zhen Chen	1254
Exploring Taxi Demand Distribution of Comprehensive Land-Use Patterns Using Online Car-Hailing Data and Points of Interest in Chengdu, China Weijie Yu, Wei Wang, Xuedong Hua, and Xueyan Wei	1268
Forecasting Federal Transportation Performance Management Bridge Condition Measures for Bridge Management Paul D. Thompson	1287
Incorporating Instantaneous Reaction Delay in Car-Following Models: A Hybrid Approach Mehdi Rafati Fard, Saeed Rahmani, and Afshin Shariat Mohaymany	1297
Multiple Correspondence Analysis of Wrong-Way Driving Fatal Crashes on Freeways Yukun Song, Huaguo Zhou, Qing Chang, and Mohammad Jalayer	1312
Chemo-Rheological Characterization of the Effect of Iran Rock Asphalt on the Performance of Waste Bio-Oil Modified Asphalts Jianmin Ma, Guoqiang Sun, Daquan Sun, Mingjun Hu, and Tong Lu	1324

Cordon-Based Pricing Schemes for Mixed Urban-Freeway Networks using Macroscopic Fundamental Diagrams Xuting Wang and Vikash V. Gayah	1339
Evaluation of a New Intersection Design, "Shifting Movements" Ma'en Mohammad Ali Al-Omari and Mohamed Abdel-Aty	1352
Effect of the Employed Material Model on the Predicted Behaviour of Corrugated Metal Pipes Hany El Naggar, Alex Campbell, and Islam Ezzeldin	1364
Finite Element Modeling of a Mechanically Stabilized Earth Trial Wall Andrew Lees and Michael Dobie	1373
Investigating the Sensitivity of Electric Vehicle Out-of-Home Charging Demand to Changes in Light-Duty Vehicle Fleet Makeup and Usage: A Case Study for California 2030 Adam Wilkinson Davis and Gil Tal	1384
Laboratory Evaluation of Aggregate Friction and Texture Properties Emmanuel G. Fernando, Edith Arambula, Sheng Hu, and William Crockford	1396
Performance of Two Thin Epoxy Overlays on New Concrete under Laboratory and Outdoor Exposure Conditions Abul Fazal Mazumder, Upul Attanayake, and Neal S. Berke	1406
Relationship between Programmed Heavy Vehicle Inspections and Traffic Safety Behrang Assemi, Mark Hickman, and Alexander Paz	1420
Equity-Advancing Practices at Public Transit Agencies in the United States Alex Karner and Kaylyn Levine	1431
Live Road Condition Assessment with Internal Vehicle Sensors Eyal Levenberg, Asmus Skar, Shahrzad M. Pour, Ekkart Kindler, Matteo Pettinari, Milena Bajic, Tommy S. Alstrøm, and Uwe Schlotz	1442
Application of Advanced Driver-Assistance Systems in Police Vehicles Vanessa Nasr, David Wozniak, Farzaneh Shahini, and Maryam Zahabi	1453