Exploring Weather Related Connected Vehicle Applications for Improved Winter Travel

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Precise and timely road weather messages are necessary for road maintenance decision and a high level-of-service trip of road users. In this context, connected vehicle (CV) technologies hold great promise in addressing the various influences of winter weather on the safety and mobility of road users. This talk starts with the results of a nationwide survey of U.S. and Canadian road maintenance road maintenance departments, which evaluated whether and how CV technologies are perceived by the practitioners for their potential in improving winter roadway safety and mobility. Then, we present a concept of operations, including the potential application and operational scenarios of CV technologies for agencies to improve winter road services.

A precise road surface friction prediction model can help to alleviate the influence of inclement road conditions on traffic safety, Level of Service, traffic mobility, fuel efficiency, and sustained economic productivity. In recent years, CV technology enables a data-driven method that can further improve the prediction performance. This talk will discuss the development of a road surface friction prediction model based on Long-Short Term Memory (LSTM) neural network using the data collected by an on-board road surface sensing device. In addition, we propose a model employing a Gated Recurrent Unit network-based decay mechanism (GRU-D) for accommodating the impacts caused by missing values in the dataset.

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Dr. Xianming Shi, P.E. is a Professor in Civil & Environmental Engineering at the Washington State University and the Founding Director of the National Center for Transportation Infrastructure Durability & Life-Extension. He has served as the Site Director for two Tier 1 University Transportation Centers, CESTiCC and CAMMSE. Dr. Shi is a Fellow of ASCE and the Editor-in-Chief for the Springer Nature Journal, Journal of Infrastructure Preservation & Resilience. Two of his projects won the AASHTO High Value Research Project award in the last five years. He won the Leon Luck Outstanding Faculty Award by the WSU Department of Civil and Environmental Engineering in 2018. One of his papers was the Best Paper 2011-2012 by the ASCE Journal of Cold Regions Engineering.

Dr. Ziyuan Pu joined Monash University as a Lecturer in October 2020. Prior to joining Monash University, he was a Research Associate in the Department of Civil & Environmental Engineering (CEE) at University of Washington (UW), Seattle, US. His active research fields include Intelligent Transportation Systems (ITS), Connected & Autonomous Vehicles (CAV), Internet of Things (IoT), urban computing, and transportation data science. He has published over 30 peer reviewed journal articles in IEEE Transactions on Intelligent Transportation Systems, IEEE Internet of Things Journal, Transportation Research Part C: Emerging Technologies, Journal of Intelligent Transportation Systems and etc.

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