Design and deployment of an integrated, portable road-weather and traffic information system

Phani Kumar Patnala, Ph.D. †

Musharraf Khan, Ph.D. †

Kerry Lynch †

Charleen Choboter †

Jonathan D. Regehr, Ph.D., P.Eng. *, †

Babak Mehran, Ph.D., P.Eng. †

† University of Manitoba

Abstract

The effects of weather and road conditions on driver behaviour, traffic patterns, and traffic safety are generally acknowledged, but a lack of micro-scale data often precludes evidence-based decisions. In November 2022, the Urban Mobility and Transportation Informatics Group (UMTIG) at the University of Manitoba, in partnership with the National Research Council of Canada (Artificial Intelligence for Logistics Program), International Road Dynamics (IRD), and Manitoba Transportation and Infrastructure (MTI), deployed a portable road-weather information system (RWIS) and integrated video classification cameras at an existing WIM installation. The integrated equipment is capable of recording time-synched data, including road surface condition, surface temperature, surface grip and ice/snow/water layer thickness, air temperature, rain state, humidity, wind speed and direction, visibility, and precipitation details. Simultaneously, the system records live video, counts and classifies vehicles (by lane), and retains the individual vehicle records generated by the WIM system.

In preparation for the first deployment, the research team worked closely with technicians from IRD and MTI to select a suitable sampling location with access to power and to complete initial calibration and equipment setup. The system's initial deployment was on a four-lane divided highway near the city of Winnipeg that serves as a major regional trucking route. Since its deployment, the system has generated an initial data set which will undergo validation as a next step.

In March 2023, the system was moved and re-deployed at a four-leg signalized intersection of a four-lane divided highway and a two-lane undivided urban arterial. For this deployment, additional cameras and a non-intrusive radar-based traffic sensor were added to monitor vehicle behaviours at the intersection as a function of traffic signal changes.

Ultimately, the data will support investigations about the impact of adverse road-weather conditions on truck operations and safety, the contribution of weather-related parameters to network resilience, and the effect of weather conditions on traffic data collection.

* jonathan.regehr@umanitoba.ca

Initial deployment of a portable road-weather and traffic information system in Manitoba

Keywords: road-weather information system, portable, traffic data collection