

JOINT TRANSPORTATION RESEARCH PROGRAM

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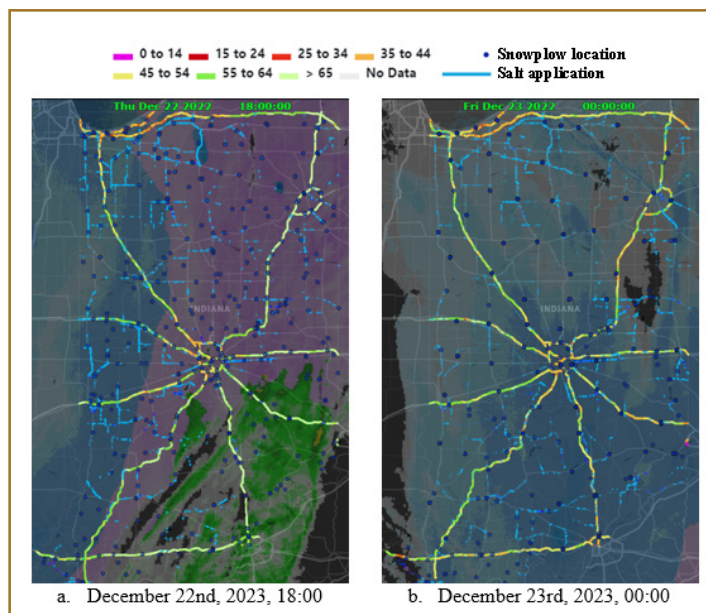
SPR-4603

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Crowdsourcing/Winter Operations Dashboard Upgrade

Introduction

INDOT has recently completed the deployment of Parsons telematics-based dash-cameras, automatic vehicle locator (AVL) positions, and spreader rate monitoring across their winter operations fleet. The motivation of this study was to develop dashboards that integrate connected vehicle data into the real-time monitoring and after-action review of winter storms. Each month, approximately 13 billion connected vehicle records are ingested for the state of Indiana and almost 99 billion weather data records are ingested nationwide in 15-minute intervals. This study developed techniques to utilize this connected vehicle data and weather data to monitor real-time mobility of interstates and post storm after-action assessments that identify opportunities to improve winter operations activities.



INDOT truck locations with salt application during December 21st–24th, 2023, winter storm.

Findings

- The findings from this project were used to guide INDOT winter operations staff.
- The heatmap dashboard developed in part by this project has been distributed and utilized by INDOT staff for monitoring winter weather events (Figure 1).
- The deltaspeed dashboard developed in part by this project, which includes real time monitoring of winter operation vehicle positions during a storm, doppler data, and real-time road speeds, has been distributed and utilized by INDOT staff for winter weather events (Figure 2).

Implementation

The visualizations and analyses developed during this project have been instrumental for the training and decision-making of roadway maintenance operations during winter weather events. The resulting tools and dashboards developed in part through this project provide detailed, almost real-time after-action reviews of mobility and safety impacts on interstate roadways in Indiana.

The dashboards have been distributed to INDOT decision makers along with interactive training to provide context to dashboards and offer opportunities to suggest improvements. These dashboards continue to be improved and disseminated to public and private stakeholders across the state and be expanded across state borders as the scalable nature of these data analysis techniques continues to drive interest across the nation. A few of the dashboards that have been fully integrated and utilized by the agency include the following.

- The “heatmap” dashboard, which allows district and sub district INDOT staff to monitor winter weather impact along routes for which they are responsible

for managing maintenance activities.

- The “Deltaspeed” dashboard, which enables real time monitoring of the position of winter operations vehicle during a storm, high resolution doppler data, and a real time road speed traffic layer.

Incorporating additional data sources, including weather and connected vehicle data, has helped provide further context to conditions during a winter storm event. When this data is combined with snowplow dash-cameras and INDOT ITS cameras, a holistic picture for real-time conditions develops. Combining all these data sources led to a widespread acceptance of using these digestible visualizations such as heatmaps and Deltaspeed dashboards to proactively monitor winter operations and winter storm impact. Traditionally these evaluations would have relied on fixed infrastructure or evidence from radio communications with plow operators. In multiple instances, these agile reviews have influenced operational changes in snow removal and maintenance around the state, leading to a marked improvement in observed mobility and safety.

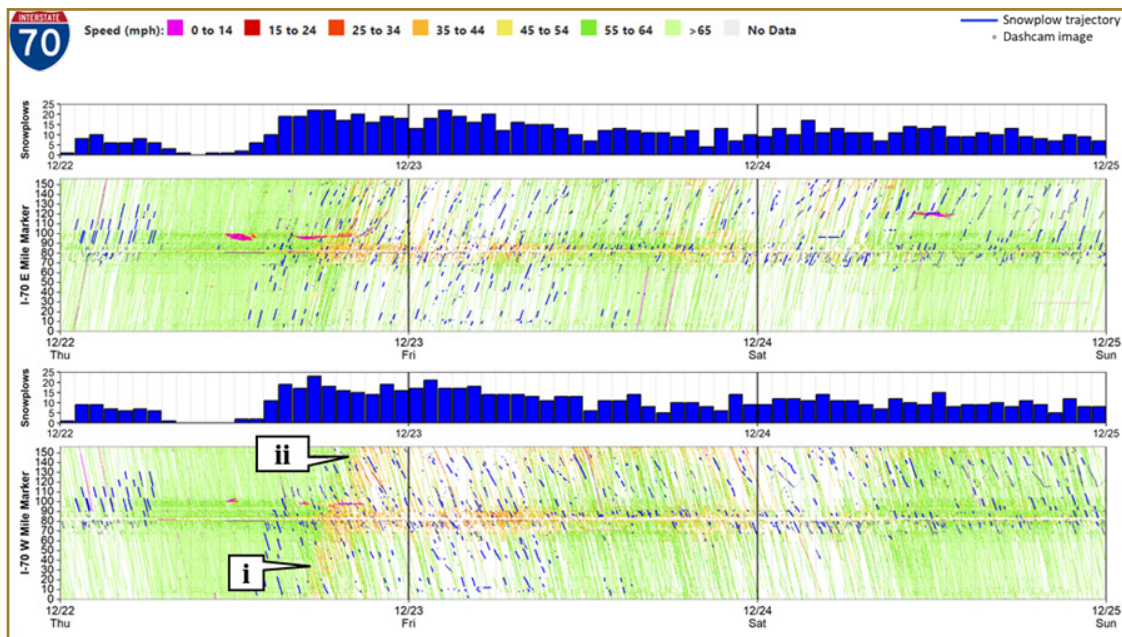
The scalability of these summaries has encouraged interest from peer states and several national webinars delivered by both Purdue and INDOT staff to share these best practices.

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I-70 Heatmap with vehicle speeds and snowplow trajectories.

