Research in Progress

Development of a Salt Spreader Controller Program Using Machine-Sensed Roadway Weather Parameters (Phase 2)

Research Need

Massachusetts owns/contracts hundreds of spreaders for delivering salt/sand/deicer to more than 15,000 lane miles of roadways during winter. Efficient and effective material delivery is crucial to maximize material utilization and minimize the potential environmental impacts.

Goals/Objectives

A complete hardware/software system with an automated road surface classification (RSC) algorithm and the salt rate prediction (SRP) model has been developed, pilot-tested, and validated with promising performance in the previous study. The performance of the developed system showed promising results. Once implemented in a more extensive fleet of MassDOT's material spreaders utilized during winter operations, it could save a significant amount of salt.

The objective of this study is twofold: 1) to develop an improved RSC algorithm by incorporating additional critical road condition categories (e.g., black ice and packed snow) and employing a more complex deep learning architecture; 2) to develop a new SRP model by incorporating the real-time mobile RWIS information from the instrumented truck, the regional stationary RWIS information, and the climate and weather forecasting information. The algorithm and model developed will be validated on multiple snowplowing trucks.

Project Information

This project is being conducted as part of the Massachusetts Department of Transportation (MassDOT) Research Program with funding from Federal Highway Administration FHWA) State Planning and Research (SPR) funds.

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Performing Organization:
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Project Start Date:
Feb 2025

Expected Project Completion Date:
Dec 2027

Methodology

The proposed methodology in this study is threefold, targeting improving the performance of the key operations in the developed system from the previous study:
1. [Integration] To integrate/implement the system (with mobile RWIS sensor, camera, GPS, GeoTab, and prototype software) with more trucks for validation with additional winter seasons
2. [Determination] To improve the deep learning-based road surface classification (RSC) model with transfer learning and new road surface data to capture challenging situations, e.g., freezing rain, black ice, etc.
3. [Control] To develop an enhanced salt rate prediction (SRP) model that will include weather forecasting information

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