Research Need Statement 535

Date:	7/31/2018
Need Statement Champion:	**Cory Johnson / Sue Lodahl**
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Idea Submitted by:	**Chen Fu Liao (UMN)**
Idea Originated from:	

Select Program:

X MnDOT   OR   ☐ Local Road Research Board (LRRB)

☐ Research   OR   X Implementation

Need Statement Title:

Driver Assist Systems to Support Snowplow Operations

Need Statement: Describe the problem or the opportunity. Include background and objective.

Previous research developed a driver assist system (DAS) to support snow plow operations. In a field operational test, a high accuracy GPS-based lane boundary guidance system was deployed to assist plow operations when visibility is poor and lane boundary cues are limited. The lane boundary guidance system uses a strip of colored (red, yellow, green) LEDs mounted on the dash of a MnDOT snowplow to guide the driver on MN-25 between Belle Plaine and Green Isle. The objective was to improve plow safety and efficiency by allowing operators to maintain a desired path on the roadway under poor visibility conditions. The current lane boundary guidance system allows operators to clear a two-lane road in two passes (one in each direction) without having to return to the same segment in order to clear off sections where the truck drifted from the desired course. Feedback from the Shakopee truck station was encouraging.

This project would instrument 3 or more additional trucks to test the developed system with plow operators in different parts of the state. The project would develop method(s) and/or tools to generate a lane boundary guide database. The project should also evaluate the placement of the LED strip on the dashboard and investigate the luminance and color perception of the colored LEDs in environments under different ambient light conditions. Due to visual perception issues, red LEDs appear brighter during the day and very dim at night. Inversely, green LEDs appear dim during the day and very bright at night. This complex perceptual issue requires a differential control of each colored LED to increase/decrease the

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intensity of the different colored LEDs so that they appear balanced in brightness across different day and night conditions. The objective is to have a simple control (i.e., a single knob) that operators can adjust the perceived brightness of the red, yellow, and green LEDs for comfortable operation under different environmental lighting levels.

Provide a summary of the potential benefits:

Improved efficiency of snowplow operations should reduce time and costs of snow removal.

How does this project build upon previous research (include title or reference to a completed research effort)?

Provide names to consider for a technical advisory panel:

Cory Johnson
Sue Lodahl
District Maintenance Engineer (or two)
Mapping
Metro Maintenance
Shakopee Truck Station (previous DAS testing)
Vic Lund