PROJECT SUMMARY

Drive MN

Project Location:
Statewide

Start – Finish Date:
March 2022 – January 2023

Project Status:
Complete

Project Partners:
University of Minnesota
Bolton & Menk, Inc.
VSL Labs, Inc.

MnDOT Project Cost:
$207,000

Projects with Similar Characteristics:
N/A

Project Description:
Automated vehicles (AVs) rely heavily on roadway infrastructure to function. This project used technology-equipped research vehicles to drive over 1,000 miles of Minnesota roadways to gain a better understanding of potential infrastructure issues that would inhibit the operations of AVs. The outcomes of this project were intended to be used by transportation professionals to make improvements to allow for the operation of automated driving and Advanced Driver Assistance Systems (ADAS). Data was gathered with vehicle technology and sensors to collect radar, LiDAR, and video data which was post-processed to identify problematic areas and place issues into the following buckets:

- Freeway ramps and turn lanes.
- Poor lane line condition and visibility.
- Construction and maintenance activities.
- Poor contrast.
- Tight curvature.
- Environmental issues.
- Dynamic lanes.

Along the drive, the team hosted live events in every MnDOT district to provide information about Connected and Automated Vehicles (CAVs), the state of the industry and vehicle technology, as well as observations made along the drive.

Project Objective:
The objective of the Drive MN project was to understand CAV infrastructure readiness throughout the state of Minnesota and engage with policy makers and transportation professionals to educate participants about CAV work and highlight the drive observations.

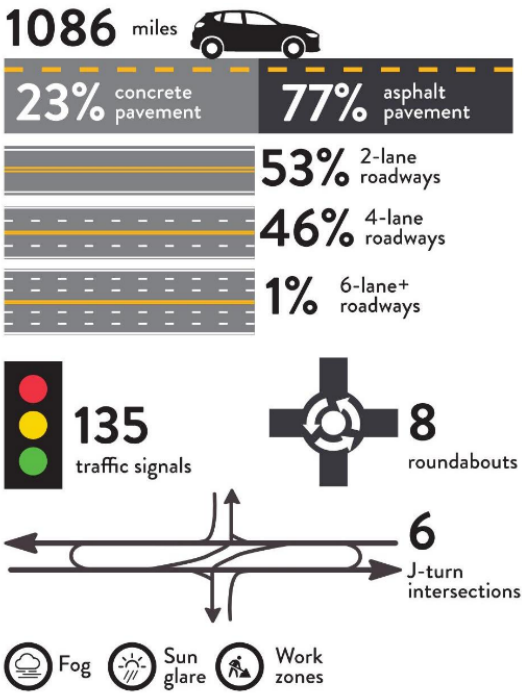

Figure 1: Drive MN Route Statistics

Project Accomplishments:

- Documenting potential infrastructure issues for AVs.
- Creating a data library of the driven routes which can be accessed and reanalyzed using different algorithms as needed.
- Increasing public knowledge of CAV technology.

Key Findings and Lessons Learned:

Drive Results

- Unstriped merge and diverge areas on ramps and turn lanes could lead to misdetection of lanes, creating undesired vehicle paths. Improper or insufficient centerline markings could also lead to misdetection.
- Pavement scarring, joints, or rumble strips could cause misdetection, especially in areas where there were previous lane reductions or shifts due to construction.
- Poor contrast between light-colored pavement and light-colored pavement markings could make it difficult for AV technology to identify lane lines.
- Tight road curvature may cause misdetections or poor performance. This issue would likely need to be resolved within AV technology since some tight curvature roadways are unavoidable.
- Environmental issues such as extreme shadows and dense fog could lead to misdetections.
- Dynamic lanes or systems such as hard shoulder running may cause confusion within the AV technology while determining which lane to be in.

Event Surveys

After events, surveys were sent to participants. Overall, the acceptance of CAV appeared to be increasing, with a positive correlation between the level of demonstration exposure and acceptance to automated vehicles.

Potential Next Steps for MnDOT:

- Utilize the information documented from this project to influence how infrastructure is designed and installed in the future to prepare for AV operations.
- Share results of this research with other activities going on, such as TRB/NCHRP, MAASTO, and other efforts.
- Review the recent MUTCD Part 5 update regarding automated vehicles to determine any potential changes to the MnMUTCD.
- Consider completing detailed reviews of key corridors prior to major construction projects to verify roadway suitability for AV operations or identify additional factors that should be considered in design.
- Incorporate results into MNDOT planning and design activities.