



TRANSCONOMY
TRANSPORTATION MEETS INNOVATION



**DEPARTMENT OF
TRANSPORTATION**

MnDOT/MnROAD Automated Distress Rodeo

To evaluate different automated methods and data analysis processes, the Minnesota Department of Transportation (MnDOT) organized a Distress Rodeo to demonstrate how new technologies can be utilized to improve/replace manual distress surveys. Using the MnROAD facility, MnDOT invited companies, universities, and research institutions to collect distress data on MnROAD's Low Volume Road test sections. For this demonstration project, MnDOT wanted to see and compare available solutions with an emphasis on both the collection and processing of data.

Scope: MnROAD test sections were made available for participants in August 2023. Participants were encouraged to collect eight locations – four hot-mix asphalt (HMA) and four Portland cement concrete (PCC) sections, including:

- 2 low distress HMA surfaces
- 2 moderate to high distress HMA surfaces
- 2 low distress PCC surfaces
- 2 moderate to high distress PCC surfaces

Prior to the start of the Rodeo, all eight sections were manually rated by several MnDOT employees. The raters then combined their results into an agreed Master Manual Survey, which was used as the reference standard.

Transconomy delineated this project into three primary phases:

Data Collection: In the Data Collection phase, Transconomy collected imagery in the form of both geocoded images and videos. The Transconomy Collector app running on an iPhone was used to collect geocoded sequential images for each of the eight test sections. The phone was mounted on the windshield of an SUV using a suction cup mount. The videos were recorded using GoPro cameras mounted on the front and rear of the vehicle. A 360-degree camera was mounted on the top of the vehicle to capture video in all directions. Transconomy deployed these three types of cameras to test which set of cameras would produce the best data. The GoPro imagery was selected for the distress takeoff due to its higher resolution and camera angle.



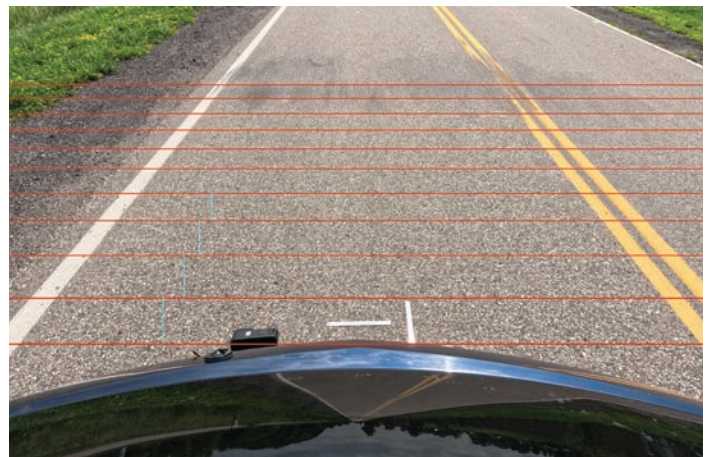
Data Processing: After collection, the imagery was synced to Transconomy's cloud for processing. The geocoordinate information embedded in the video files and the frames associated with each geocoordinate were extracted using an automated algorithm to create a dataset of geocoded images. Since the videos encompassed the entire test track, the data was filtered to create eight distinct datasets to correspond with each test section. This was achieved via an automated process employing an algorithm which uses the test section segmentation provided by MnROAD and segregates the images based on their geocoordinates into distinct datasets by superimposing them onto the base map.

Data Analysis: Transconomy then used the distress detection AI model for identification and classification. Rigorous quality control processes were applied to ensure the precision and accuracy of distress annotations. Finally, the Data Analysis phase encompassed the use of sophisticated algorithms for length and width calculation of pavement distresses.

Results: The project culminated in the successful delivery of a comprehensive dataset documenting pavement distresses, dimensions, and classifications.

These results were effectively presented in a detailed spreadsheet adhering to the MnROAD template. The process used by Transconomy was documented in a report presented to MnDOT. Some of the details in the report include:

- Data collection field techniques
- Type of data collected
- Collection system
- Collection time
- Analysis methods
- Processing time
- Data storage
- Scalability
- Cost to perform collection and analysis
- Workability range (surface conditions, weather, does the road need to be closed).



The distress results from all of the methods used at the Rodeo are currently being analyzed by MnDOT/MnROAD (as of January 2024). A report of the results will be available in 2024.

Value to Minnesota DOT: The MnROAD Automated Distress Rodeo project provides substantial value to MNDOT/MnROAD by introducing a low-cost, safer, state-of-the-art, and semi-automated pavement evaluation process as an alternative to manual distress surveys.

Through the amalgamation of AI-based distress detection and rigorous stratified quality control, this demonstration provides another potential tool in their toolbox of pavement distress measurement systems. The Transconomy solution's scalability, cost-effectiveness, and minimal equipment maintenance requirements underscore its long-term viability. Transconomy's innovative approach provides a comprehensive and reliable assessment of transportation infrastructure; establishing the groundwork for proactive maintenance strategies, strategic planning, and data-driven decision making.



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