

Memo

To: T. Ahlborn, D. Harris, L. Sutter, R. Shuchman, and the rest of the Project Team

From: A. Endsley, M. Forster, C. Brooks, H. de Melo e Silva

CC: C. Singh

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Number: 27

Subject: Description of the Decision Support System (DSS) evaluation by the Michigan Department of Transportation and the Technical Advisory Committee capabilities of the DSS for integrated bridge assessment as well as the DSS itself.

The Decision Support System (DSS) focus group reconvened on March 1, 2012 at the Michigan Tech Research Institute (MTRI) office in Ann Arbor, MI. Invited from the Michigan Department of Transportation (MDOT) were; Jason DeRuyver, David Juntunen, Rich Kathrens, Steve Cook, and Bob Kelley. From the Technical Advisory Committee, Amy Trahey from Great Lakes Engineering Group, a contractor, was also invited.

Under the suggestion of Jason DeRuyver, Melissa Knauff from MDOT was invited but ultimately could not make it. Beckie Curtis (MDOT Bridge Management Engineer) attended on behalf of Dave Juntunen. The attendance list from the March 1 meeting is as follows:

- Jason DeRuyver, MDOT
- Rich Kathrens, MDOT
- Beckie Curtis, MDOT
- Richard Wallace, CAR
- Mike Forster, CAR
- Qiang Hong, CAR
- Amy Trahey, GLEG
- Larry Sutter, MTRI
- Colin Brooks, MTRI
- Jim Ebling, MTRI
- Bob Shuchman, MTRI
- Arthur Endsley, MTRI
- Rick Dobson, MTRI
- David Dean, MTRI

The morning session consisted of presentations by team members, followed by a live demonstration of the DSS. The progress in research and commercial evaluation of remote sensing technologies for bridges, highlighting the most promising technologies that have emerged from the 2-year study was also presented. A presentation outlining the progress made in developing the DSS and the anticipated outcomes of the focus group was presented as well:

- Feedback on the functionality, completeness, ease-of-use, and relevance of the demonstration DSS.
- Feature requests for any missing or incomplete functionality.
- Identification of obstacles to implementation at a state transportation agency.
- Identification of barriers to user adoption (adoption by decision-makers).

The DSS live demonstration was projected onto a screen for the entire group to follow along. The complete functionality of the DSS was demonstrated, highlighting important features such as:

- Plotting bridges across the inventory on a map.
- Filtering the bridge inventory (e.g., all bridges in the Metro Region; all bridges with a bridge deck rating less than 4) and viewing a subset on the map.
- Obtaining driving directions to a bridge from an MDOT office, postal address, or arbitrary latitude-longitude pair (Figure 1).
- Viewing highway traffic condition symbolized on the map.
- Spatial filtering by predefined areas of interest (e.g., counties, regions) through map overlays.
- Spatial filtering by arbitrary polygons drawn on the map (e.g., filter to bridges along a traffic corridor, see Figure 1).
- Spatial filtering by the current map extent (i.e., filter to all bridge in current map view only).

- Changing symbology of table-rows, bridge markers on map to symbolize NBI bridge deck, superstructure, substructure, or culvert ratings or sufficiency ratings.
- Zooming to individual or multiple bridges by table selection.
- Viewing Bridge Viewer Remote Camera System (BVRCS) photos in the DSS; a visualization experience similar to Google StreetView (Figure 2).
- Viewing GigaPan System photographs and where they were taken from.
- Viewing remote sensing data as map overlays, including delamination and spall feature maps and digital elevation models (DEMs, see Figure 2).
- Accessing remote sensing metrics such as percent spalled, percent delaminated, and International Roughness Index (IRI) calculations from 3D optics through a custom "Bridge Deck Health Signature" scoring table (Figure 2).
- Executing arbitrary queries on Pontis data (Figure 1).

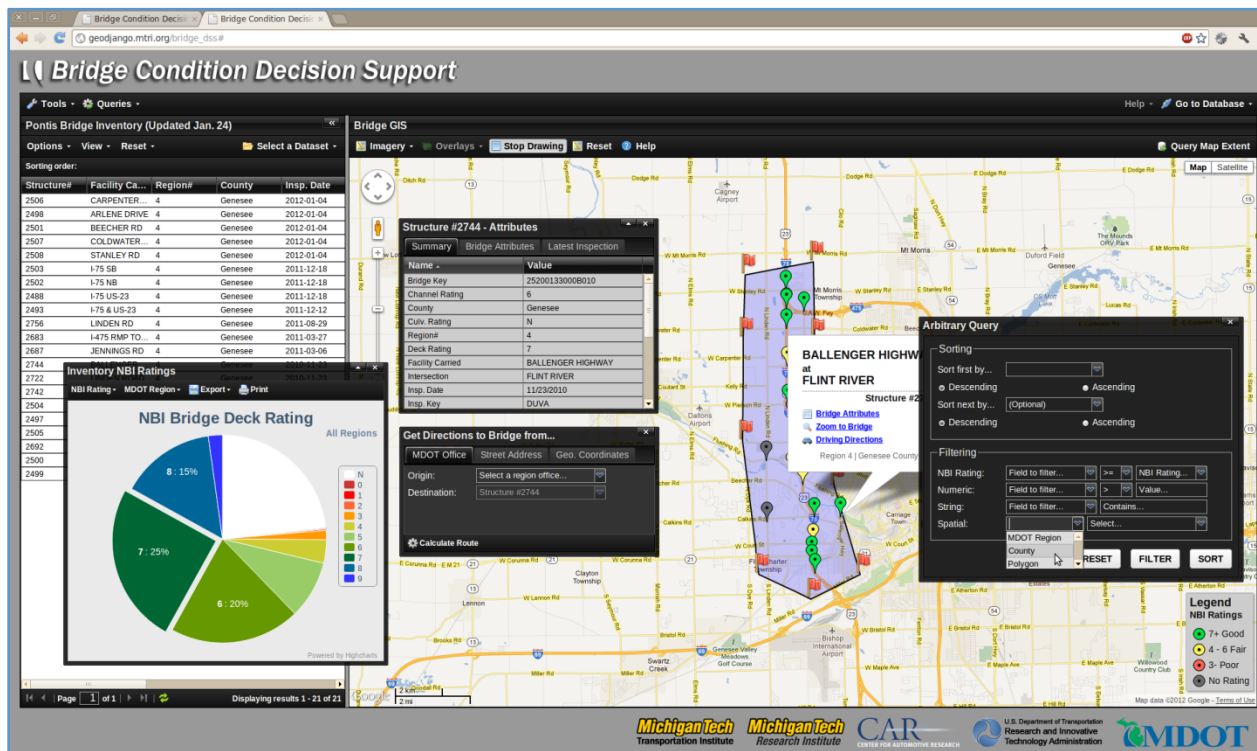


Figure 1: Screenshot of the DSS version as evaluated by the focus group; showcases inventory view of condition information, spatial filtering, arbitrary Pontis query construction, and the directions utility.

Before, during and after lunch, focus group participants were invited to evaluate the DSS themselves. Multiple instances of the DSS were started on laptop computers so that participants could interact with the application. Afterwards, the team presented the focus group participants with a number of questions intended to drive discussion about the DSS version they evaluated.

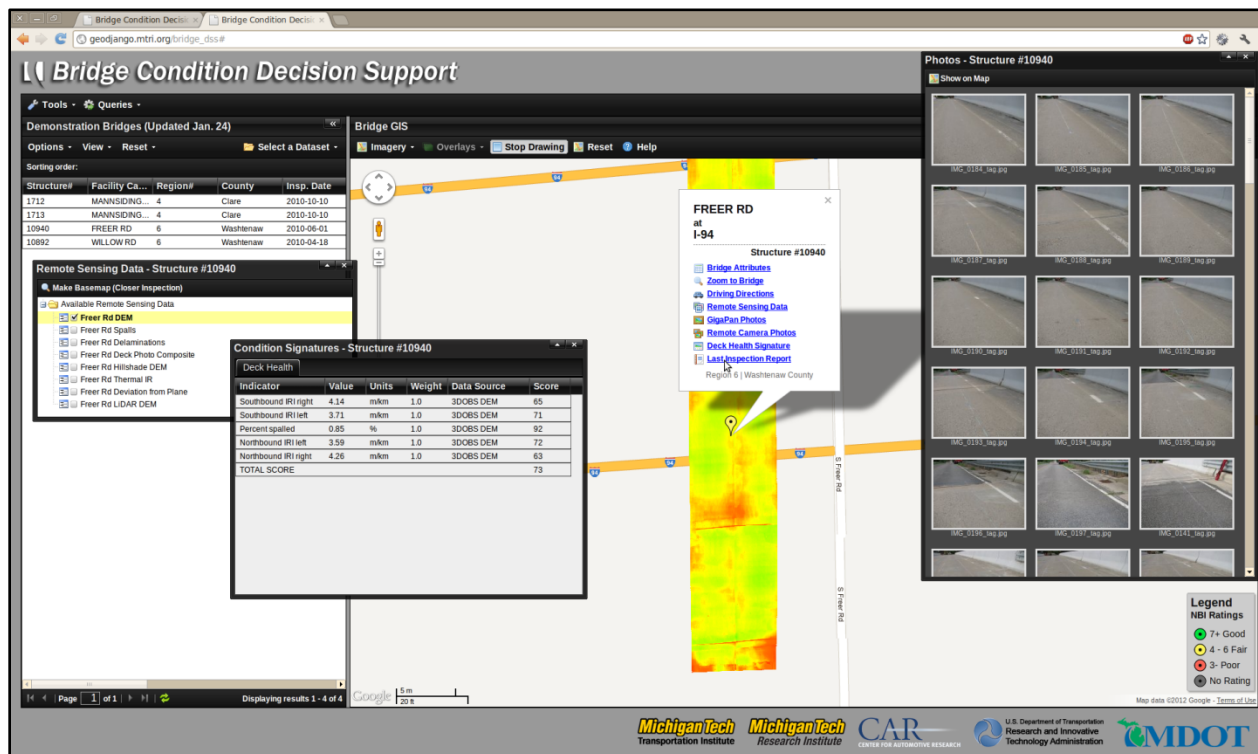


Figure 2: Screenshot of the DSS version as evaluated by the focus group; showcasing the bridge photo inventory, remote sensing overlays, and metrics that are available per bridge.

Beckie Curtis and Rich Kathrens from MDOT were instrumental in the discussion about bridge inventory information visualization and access. In fact, during the lunch hour, Rich Kathrens gave a brief, informal presentation of an early version of an improved Michigan Bridge Reporting System (MBRS) that has some of the features the DSS currently has and some that MDOT would like to see developed. The primary feature requests and improvements that were identified and which are planned to be implemented by project's end are:

- Require login credentials to access the DSS so as to protect MDOT bridge inventory data.

- Remove the count of 'N' ratings from the National Bridge Inventory (NBI) rating distributions.
- Extend the ability to chart the distribution of NBI ratings to filtered subsets of the bridge inventory (e.g., for a specific county, for a spatially-filtered subset).
- Display the date of the last Transportation Management System (TMS) export on the pie chart.
- Charting of historical bridge condition information, namely bridge deterioration curves.
- View more than 30 bridges (current per-page limit), in fact, view the entire inventory or filtered set on the map.
- Order bridge attribute names by structure inventory and appraisal (SIA) number, which is also the NBI item number.

By the end of the month, an evaluation by the TAC is planned. These are some of the improvements to the DSS planned before April is over:

- A secure login has already been implemented.
- More remote sensing overlays will be available, including Light Detecting and Ranging (LiDAR) DEMs, derived DEM products such as deviation-from-a-plane, high-resolution photo composites, and thermal infrared imagery.
- The BVRCS photo inventory points have already been improved with more intuitive positioning.