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Research Title:

GIS Tool to Measure Performance of Winter Highway Operations

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Research Summary Series

A series to disseminate results of research being conducted by the Midwest Regional University Transportation Center, Federal Highway Administration, and Wisconsin Department of Transportation

GIS Tool to Measure Performance of Winter Highway Operations



Project 04-01

Research results in a quick and easy-to-read format

Project Overview

One of UW-Madison's primary activities on the Winter Maintenance Concept Vehicle Project has been development of a geographic information system (GIS) application, referred to as "Wisclow". This software system computes winter maintenance operations performance measures by integrating and analyzing environmental, equipment status, and materials usage data coming from the vehicles with spatial databases of roadway centerlines, attributed with patrol sections, route systems, number-of-lanes, and functional class. Patrol sections are roadway segments usually assigned to one vehicle. Manually-entered data, such as storm event types and durations, labor and equipment cost

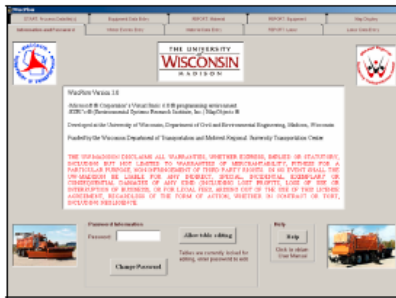


Fig 1. Wisclow User Interface

rates, and vehicle equipment configurations are also used in the computation of performance measures. Wisclow outputs include reports and decision management tools (e.g., charts, graphs, and maps) that show values of, and relationships among, computed performance measures.

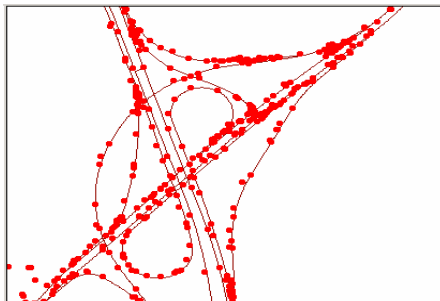


Fig 2. Multiple Ambiguities at a Complex Interchange

Conclusion

Decision management tools allow managers to visualize relationships among performance measures and make well-informed decisions on their business practices. Ultimately, Wisclow is intended to help transportation agencies at multiple levels (i.e., central office, districts, and counties) to measure performance of winter operations. Before participating counties can use Wisclow successfully, several impediments must be overcome. One impediment results from positional errors in both vehicle data and roadway spatial databases. Early sensitivity testing of performance measures revealed computational problems arising from spatial ambiguities in these data sets. Because of positional errors in the GPS coordinates of the vehicles and in the spatial databases (digital maps), vehicles were sometimes associated with the wrong roadway. This "map-matching" problem was addressed on the project by development of an effective algorithm that resolves most of the ambiguities. Another impediment that limits the effectiveness of the Wisclow application is a lack of accurate and attributed spatial databases. Before Wisclow can be used productively, counties must have accurate roadway centerline spatial databases and these databases must be attributed in certain ways. While a few of the participating counties have adequately accurate spatial databases, many of them do not. Moreover, none of the counties' spatial databases are attributed to be operational with Wisclow.

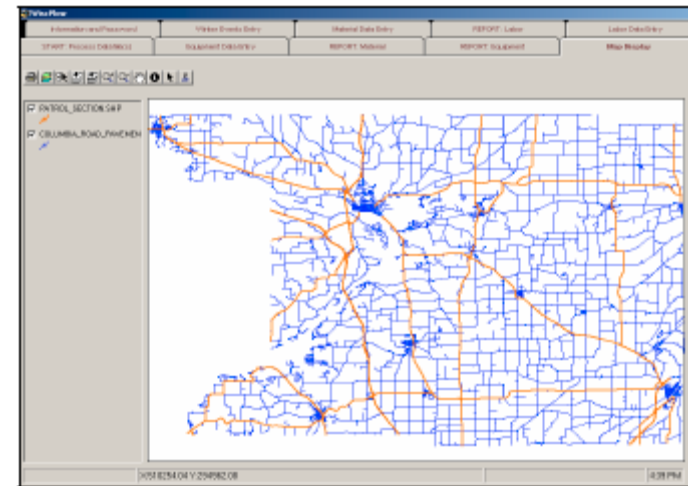


Fig 3. Map Display Tab