



The new Iowa Pavement Analysis Techniques (IPAT) tool will help county engineers plan and prioritize maintenance treatments to keep local highways in good condition for years to come.

RESEARCH SOLUTIONS

New pavement analysis tool will help county engineers plan for maintenance needs

To maintain local roadways in good condition for the traveling public, Iowa county engineers monitor pavement conditions and analyze a wealth of pavement data to predict when maintenance will be needed. However, it can be challenging and time-consuming to translate these data points into reliable estimates of future pavement performance. Researchers developed the Iowa Pavement Analysis Techniques (IPAT) tool, an easy-to-use spreadsheet-based tool for modeling a pavement's remaining service life (RSL). With reliable RSL estimates in hand, county engineers can better plan and prioritize roadway maintenance and rehabilitation projects to make the best use of limited resources.

THE NEED

State highway agencies are required by federal regulations to develop Transportation Asset Management Plans that guide decision-making about highway pavement maintenance using performance-based approaches. At the local level, county engineers monitor pavement

conditions and plan maintenance and rehabilitation projects to keep pavements in good condition as long as possible. One performance-based strategy used to make maintenance decisions is the concept of an asset's remaining service life (RSL): the time remaining before significant rehabilitation or reconstruction will be necessary.

State agencies use varying, often complex formulas for estimating RSL. These calculations typically factor in the current pavement condition (such as its International Roughness Index score, or IRI) and other information such as the pavement's age, structural design features, material properties, construction and maintenance history, and traffic volume. In Iowa,

(continued)



“Iowa’s counties needed an easy-to-use tool to predict the life of their pavements based on ride quality. This research was successful in meeting those needs.”

— BRIAN MOORE,

Secondary Roads Research Engineer, Iowa County Engineers Association Service Bureau (ICEASB)

county engineers needed a tool that could automate these calculations, using available pavement data to project future pavement performance and develop accurate RSL estimates.

RESEARCH APPROACH

The research team first reviewed how others have defined and used RSL models. These models have many benefits: They provide an estimate of when rehabilitation will be required, which is an output that is easy for all stakeholders, including the public, to understand. They can be developed from many kinds of functional and structural data, and can help agencies meet federal requirements for planning and performance management.

To develop an RSL prediction tool for Iowa roadways, researchers first developed models of pavement performance over time using two approaches:

- **Statistically (mathematically) defined.** Ideal for project-level analysis, this approach requires very few data and can be used when only a few details on pavement condition or structural and traffic data are available.
- **Artificial intelligence-based, using artificial neural networks (ANNs).** This approach is very effective for modeling network-level pavement performance, where there are many pavement sections with varying thicknesses, traffic volumes, and deterioration trends.

The research team then developed RSL models for four common pavement types: jointed plain concrete pavement (JPCP), asphalt concrete (AC), a composite of AC over JPCP, and portland cement concrete overlay. The models were developed using pavement data from Iowa DOT’s Pavement Management Information System database, then validated and refined using data from Iowa county roadways.

Finally, researchers developed the IPAT tool, a spreadsheet-based pavement analysis tool that incorporates all of the pavement performance prediction and RSL models. The tool provides a series of options for estimating RSL at the project or network level based on various conditions and distress data availability in individual counties.

WHAT IOWA LEARNED

With a user-friendly interface, the IPAT tool will help county engineers make efficient use of new and existing pavement data to predict pavement performance. By converting pavement condition measures into reliable estimates of how well or how long a road will continue serving the public, the tool can help Iowa counties make meaningful distinctions between two pavements that have the same IRI—and make maintenance and rehabilitation decisions that provide the most efficient use of county funds.

PUTTING IT TO WORK

The IPAT tool and user guide are available for counties to download from the

study’s [project page](#). To further enhance Iowa counties’ pavement asset management capabilities, a separate [research project](#) is developing a smartphone app that agencies can use to quickly and easily collect pavement roughness data. In addition, the IPAT tool could be enhanced through future research; possible enhancements include developing an IPAT mobile application and integrating the IPAT tool with a geographic information system (GIS) platform.

ABOUT THIS PROJECT

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