A Framework for Development of Iowa Pavement Analysis Technique

Orhan Kaya
Graduate Assistant-Research, Iowa State University, okaya@iastate.edu

Nazik Citir
Graduate Assistant-Research, Iowa State University, ncitir@iastate.edu

Halil Ceylan
Professor, Iowa State University, hceylan@iastate.edu

Sunghwan Kim
Assistant Research Scientist, Iowa State University, sunghwan@iastate.edu

Yang Zhang
Postdoc Research Associate, Iowa State University, alex19@iastate.edu

Danny Waid
Executive Director, Iowa County Engineers Association Service Bureau, danny.waid@iceasb.org

Brian Moore
Secondary Road Research Engineer, Iowa County Engineers Association Service Bureau,
brian.moore@aceasb.org

Many state transportation and local road agencies are required to develop performance-based approaches based on The Moving Ahead for Progress in the 21st Century (MAP-21) Federal Transportation Legislation. One of the performance-based approaches to facilitate pavement management decision-making process is use of remaining service life (RSL) models. As part of on-going Iowa Highway Research Board project entitled "Development of Iowa Pavement Analysis Technique", this study presents a detailed framework for the development of pavement performance and RSL prediction models for Iowa pavement systems. To develop such RSL models, pavement performance models for both project and network-level analysis were initially developed. While statistically (or mathematically) defined pavement performance models were found to be accurate in predicting pavement performance at project level, artificial intelligence (AI) based pavement performance models were found to be successful in predicting pavement performance in network level analysis. Network level pavement performance models using both statistical and AI based approaches were also developed to evaluate the relative success of these two models for network-level pavement-performance modeling. As part of this study, in development of pavement RSL prediction models for three pavement types, automation tools for future pavement performance predictions were developed and used along with Federal Highway Agency (FHWA)-specified threshold limits for various pavement performance indicators. These RSL models will help engineers in both network and project level decision-making processes and for different types of pavement-management business decisions.

Keywords: pavements; remaining service life; artificial intelligence; performance