Weibull-Based Bridge Deterioration Models for Iowa Bridges

Dimitrios V. Bilionis  
Graduate Research Assistant/ MS Student  
Institute for Transportation  
Civil, Construction and Environmental Engineering  
Iowa State University  
Email: bilionis@iastate.edu

Başak Aldemir Bektaş, PhD  
Associate Scientist  
Iowa State University  
Institute for Transportation (InTrans)  
2711 South Loop Drive Suite 4700  
Ames IA 50010-8664  
Office Phone: (515) 294-4033  
Email: basak@iastate.edu

Bridge management decisions at the network-level are majorly decisions among alternative maintenance, rehabilitation, and replacement (MR&R) efforts under a given budget. In order to help bridge managers make objective and data-based decisions, bridge deterioration models are developed to predict the future condition of bridges. These models are typical inputs to a bridge management system (BMS) or other decision-support tools used by bridge managers. Deterioration models are statistical relationships between a dependent variable, such as time-in-state or change in condition, and a set of explanatory variables including traffic, age, environmental factors, and design properties. These models show bridge managers how the bridges in their network deteriorate over time. Models based on a rich inspection history that sufficiently represent the bridge network can aid bridge managers in giving objective decisions.

In this study, deterioration models for National Bridge Inventory (NBI) condition ratings were developed for Iowa bridges based on inspection data from 1983-2010 duration. Among a variety of deterministic, stochastic or artificial intelligence deterioration models available in the literature; Weibull-based discrete-time, time-based models were selected for this study. Separate models were developed for deck, superstructure and substructure ratings. Initial results from the study were discussed with Iowa
DOT staff to refine and improve the models. The findings from the analysis and discussions with the Iowa DOT staff are going to be presented along with the final models and conclusions.