PHD Dissertation Defense

COST-EFFECTIVE SELECTION OF PAVEMENT TREATMENT TYPE AND OPTIMUM TIME AND SPACE

By

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Abstract:
Since the early 1970’s, several State Highway Agencies (SHAs) have developed elaborate pavement condition and distress data collection systems. Advancements in the data collection techniques precipitated improvements in the data usage. Such improvements include better modeling of the time-series pavement condition and distress data to assess pavement performance and to predict future conditions. Available time-series pavement condition and distress data were obtained from the Colorado Department of Transportation (CDOT), the Louisiana Department of Transportation and Development (LADOTD), the Michigan Department of Transportation (MDOT), the Washington State Department of Transportation (WSDOT), and the Minnesota Road Research project (MnROAD). The data for five pavement condition and distress types and six pavement treatment types were modeled with the appropriate mathematical functions and used to: 1) assess the pavement conditions and rates of deterioration before and after the treatment and the treatment benefits; 2) to develop methodologies for estimating the pavement conditions and distresses of the passing lanes using the driving lane condition and distress data and the traffic distribution factors; and 3) determine whether or not the data support the analyses of the cost effectiveness of various pavement treatments.

It is shown that: 1) The existing data support the data modeling and the consequent prediction of future pavement conditions and distresses and rates of deterioration. 2) The conditions and distresses of the pavements of the passing lanes could be accurately predicted using the newly developed methodologies, the historical condition and distress data of the driving lane, and traffic distribution. 3) The details of the existing cost data did not support cost effective analyses of pavement treatments; rather treatment effectiveness was analyzed and discussed using one newly developed algorithm and two existing ones.

In addition, Treatment transition matrices (T^2Ms) were developed to conveniently display the results of the analyses before and after treatment and the treatment benefits in a matrix format. The data in the T^2Ms were also used to perform statistical analysis to determine whether or not the pavement condition states after treatment are associated to those before treatment.

Finally, step-by-step guidelines and procedures for the implementation of the findings of this study were developed and are included in Chapter 5 of this dissertation.