Analysis of Traffic Speed Deflectometer Data for Evaluating Pavement Condition in Oklahoma

Introduction

The Traffic Speed Deflectometer (TSD) is a modern device for network-level structural and functional condition evaluation of pavements.

FWD vs TSD

- Can collect pavement condition data at traffic speed
- Quick method

Data collection and processing employing TSD

Deflection Slope:

\[ S = \frac{V_y}{V_h} \]

Where,

- \( S \): deflection slope
- \( V_y \): vertical pavement deflection velocity
- \( V_h \): Vehicle horizontal velocity

Deflection:

\[ d(x) = \int_{y=0}^{\infty} s(y)dy \]

Where,

- \( s(y) \): slope at location \( y \) measured from applied load
- \( d(x) \): deflection at location \( x \) measured from the applied load

Efficiency of TSD

- TSD and FWD data are comparable
- Good short-term repeatability of TSD measurements
- Good long-term repeatability of TSD measurements

Analysis of TSD data for evaluating pavement condition in Oklahoma

- A collaborative effort between OSU and ODOT
- Analysis of the data obtained from different lanes of two different roads in Oklahoma (I-35 and SH-7)
- Data processing is performed in R for isolating different sections according to their conditions
- For isolating different pavement sections with different structural conditions, deflection basin parameters, originally developed for FWDs are being used

Visualization of Data

- Helps in getting initial information about pavement condition from data
- Overall condition of lane 1 is poorer than lane 2
- Cracks are visible in lane 1

Correlation analysis of structural parameters

- Provides insights about the conditions of different roads when compared with respect to one another
- Can be performed for different structural parameters
- Can be useful for relative allocation of maintenance funds

Summary

- TSD data can be analyzed to gain initial insights about the road conditions
- Correlation analysis of different structural parameters will help identify damage to different pavement layers
- Comparative box plots between different sections can be particularly useful during maintenance fund allocations
- Combined analysis of structural and functional condition data will lead to better pavement management practices

Future directions

- Back-Calculation of pavement layer moduli in conjunction with GPR data
- Development of generalized TSD indices for implementation into ODOT’s pavement management system

Reference


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