An Integrated Work-Zone Computer System For Capacity Estimation, Cost/Benefit Analysis, and Design Of Control

Work zones have been wildly recognized as one of the main contributors to increased delays and deteriorating traffic safety on highway networks. The effectiveness of work-zone operational and control strategies is contingent on an accurate estimate of the available work-zone capacity.

Objectives

The primary objective is to develop a computer system to guide Maryland State Highway Administration (SHA) engineers and consultants in estimating work-zone capacity and analyzing work-zone traffic impacts.

Description

The system consists of an intelligent user-interface, an analytical computing module, a microscopic simulation model, and an output analysis module. Depending on the nature of a proposed work-zone plan, one can either perform the preliminary estimate with the embedded analytical module or conduct an in-depth cost-benefit analysis with its simulation model. To capture the unique behavioral patterns of local drivers in response to perceived work-zone operations, this study conducted a series of field observations on car-following behaviors, lane-changing behaviors, and headway distributions among vehicles approaching lane-closure locations, and applied all field-observed information in calibrating key model parameters. The purpose is to ensure that all analysis results produced from the proposed work-zone analysis program accurately reflect the actual benefits, costs, and resulting traffic impacts on Maryland’s highways.

Results

This report presented a complete set of procedures for constructing an analytical model for work-zone capacity estimation, which consist of field surveys, data analysis, and model development. The proposed procedure also includes an approach that can use the field survey results to calibrate a microscopic simulation to capture local driving behaviors. A case study based on field data collected over seven days on the segment of I-95 between MD 216 and MD 175 was also presented.

The final research product, a computer program called LCAP has a Basic version that integrates the estimation model developed in this research and some previous studies, and a Pro version that takes advantage of an advanced microscopic simulation model for analyzing more complex geometric features, such as ramps in work-zone areas. Both versions are being extensively used by SHA engineers and consultants.

Report Information

For more information on this study please contact Dr. Gang-Len Chang, University of Maryland, at 301-405-1953 or gang@umd.edu.