Research Project: SP308B4R
June 2004

RESEARCH SUMMARY

INTEGRATED MANAGEMENT OF HIGHWAY MAINTENANCE AND TRAFFIC

Problem

Highway maintenance, especially pavement rehabilitation or resurfacing, requires lane closures. Given the substantial cost to highway agencies and the substantial traffic disruption and safety hazards associated with highway maintenance work, it is desirable to plan and manage the work in ways that minimize the combined cost of maintenance, traffic disruptions and crashes.

Objectives

This study aims to develop an integrated model as a decision support system to help highway agencies in designing traffic control plans for maintenance activities and in efficiently managing traffic around highway work zones. This model is designed to evaluate and optimize work zone characteristics, work schedules, traffic diversion to alternate routes and traffic control options in order to minimize the combined total costs for highway agencies and users.

Description

This project reviews the relevant literature and develops methods for analyzing the impacts of various decisions about work zones and traffic diversion plans on the time and cost required to accomplish the work as well as on the travel times and costs incurred by motorists. Work zone models are developed for three cases: (1) a single maintained road with steady traffic inflows, (2) a single maintained road with traffic inflows that vary over time, and (3) a road network with multiple detour paths. These models can be used for evaluating and optimizing maintenance plans, work schedules, and traffic diversion to alternate routes and traffic management around highway work zones. The objective of the work zone optimization problem is to minimize the total cost including the maintenance cost and user cost. The relative importance of these cost components may be specified by model users. Work zone optimization problems are solved with analytical methods for steady traffic inflows and heuristic Simulated Annealing algorithms for time-dependent inflows and multiple detour paths.

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Results

An integrated set of models has been developed for analyzing and optimizing work zone alternatives at various levels of detail, depending on options considered, resource constraints, and data availability. These models can help determine how roads or networks should be divided into work zones, how long and wide (i.e. how many closed lanes) the zones should be at various times, when the work should be scheduled, how much traffic should be diverted to which alternate routes, how flows in alternate directions should be controlled on two-lane roads, and various other aspects of work zone planning.

The models are integrated into a user-friendly software package, called MDZONES. The methods and software allow users to analyze work zone options (i.e. work zone closure alternatives, closure durations, diversion paths and flows, etc.) at various levels of detail, depending on the availability of input data and time for analysis.

Report Information

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