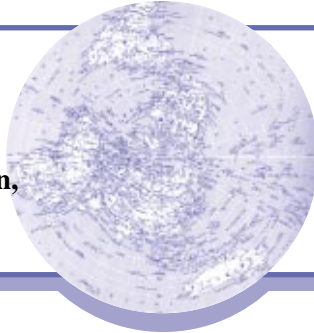


EVALUATING THE EQUITY AND EFFICIENCY OF RAMP METERS

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Why This Research is Needed

Recently there has been a move to require benefit and cost analyses of new regulations and new investments at the federal level, as well as in the State of Minnesota. But it is difficult to make these measurements—not only is there uncertainty about the future and lack of information about the present, there is dispute as to the underlying quantification of benefits and costs. Many measures can be used to assess the effectiveness of transportation systems such as ramp meter installations, but a framework for integrating these disparate measures remains elusive.

Research Objective

To develop performance measures which can be used to evaluate the positive and negative effects of ramp metering as a traffic control strategy.

Methodology

The researchers' first task was to define and develop performance measures to assess the effectiveness of ramp meters in terms of equity and efficiency over short-term and long-term time scales. Perspectives on "effectiveness" were drawn from numerous fields: Urban Planning, Geography, Engineering, Public Policy, Economics, and Management. Mobility and equity emerged as important concepts in performance measurement. In order to give a complete picture of ramp meter effectiveness, equity measures were computed for ramps, freeway segments, and origin-destination (O-D) pairs,

The newly developed performance measures were



Assistant Professor David Levinson (left, rear) with graduate students Atif Sheikh, Lei Zhang and Shantanu Das

then applied to observed data collected by Mn/DOT's Traffic Management Center before and during an experimental ramp meter shutoff period mandated by the state legislature. Data were gathered on a selected segment of State Route 169 between I-494 and I-94.

Research Results

The Twin Cities' ramp metering system was originally designed with the goal of maximizing through-

put on the freeway network as a whole—the underlying assumption being that if more vehicles are able to move smoothly along the freeways, fewer vehicles will burden local streets. According to this standard, Levinson and his team found, the metering system is performing well: freeway speeds and flows are consistently higher with ramp metering than without.

Ramp meters are particularly advantageous for travelers making long trips as opposed to short trips. The researchers found that, in data-collection area, trips more than three exits in length benefit, while those less than three exits in length are hurt by ramp metering. As urban freeways have evolved to serve commuters as well as long-haul travelers, this finding has important implications for developing ramp metering strategies that reflect the priorities of the driving public.

The current metering algorithm does not address the way delay is distributed to drivers within the metered freeway system. In order to satisfy equity considerations, a mechanism for limiting delay in ramp queues may be necessary

Research Impacts

Much effort is currently being devoted to developing ramp metering algorithms that are more acceptable to the driving public. The findings of Levinson’s team have important implications for this process. In particular, this research has given traffic managers and transportation researchers a framework for evaluating ramp metering.

What’s Next

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