Using Naturalistic Driving Data to Explore Possibility of Modifying Driver Behavior That May Cause Non-recurring Congestion

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ABSTRACT

Congestion on highways may not be strictly caused by recurring bottlenecks (e.g., lane drops), but in many cases may be caused by non-recurring bottlenecks (e.g., incidents, inclement weather, etc.). According to the Federal Highway Administration (FHWA), approximately half of congestion is caused by temporary disruptions that remove part of the roadway from use, or "non-recurring" congestion. These non-recurring events dramatically reduce the available capacity and reliability of the entire transportation system. Non-recurring congestion is usually unpredictable in comparison to recurring congestion but can be prevented in many cases. Driver error – such as inattention, decision errors, or recognition errors – is one of the major causes of incidents that result in non-recurring congestion. With proper video devices and other data collection equipment, researchers can collect naturalistic driving data. These data can be viewed to obtain information about driver behavior and the external driving environment. The purpose of this study is to examine existing naturalistic datasets that include video and numerical data to determine the potential for using these data to explore how to modify driver behavior in an attempt to reduce non-recurring congestion.

Key domestic and international studies where in-vehicle video cameras were used to collect data were investigated in this study. Four datasets collected by VTTI and UMTRI were analyzed. Dimensions of feasibility were defined to evaluate the data sets with respect to legal restrictions, comprehensiveness, video data quality, in-vehicle data quality, linkages to external data, and structure. The video data were manually reviewed, and data reduction was conducted to identify contributing factors to crashes and near-crashes using video data and supplementary data. Countermeasures are then proposed to modify such behaviors. The concluded that using naturalistic driving data to study travel time reliability is feasible if the data collection duration is extended to capture enough number of severe crashes. Due to the limited number of severe crashes that result in congestion in existing datasets, the authors used substitute datasets and simulation to build statistical models for travel time reliability modeling. Potential problems in existing data sets are discussed and recommendations are made for future research.