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Arterial incident detection using fixed detector and probe vehicle data

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Abstract

This paper describes incident detection algorithms for urban arterial streets using two distinct data sources: fixed traffic detectors and probe vehicles. The data sources are used independently to obtain two distinct algorithms. This approach is undertaken to increase the overall coverage of incident detection capabilities as early implementation will result in relatively few cases when data is available from both fixed detectors and probe vehicles on the same link and during the same time period. The algorithms were developed using simulation data for the *ADVANCE* ITS operational test; they will subsequently be recalibrated with field data collected during the *ADVANCE* demonstration project. Discriminant analysis was used to estimate a variety of models based on different traffic flow measures from each data source. Various functions of fixed detector measures (volume and occupancy) and probe vehicle travel times were considered for inclusion in the fixed detector and probe vehicle algorithms, respectively.

The most effective variables for detecting incidents were volume divided by occupancy (which is related to average speed) for fixed detectors and average speed for probe vehicles. In both cases, traffic measures for the incident link were most useful for incidents located in the downstream portion of the link and for the next upstream link for incidents located at the upstream end or in the middle portion of the link. Further, it was generally found that data from a single link provided almost equally good incident detection as data obtained from pairs of links. This led to the development of an algorithm that uses data from a single detector or link, thereby supporting incident detection on any link that has a current data independent of data availability from other links. The performance of the algorithms was evaluated using detection rates and false alarm rates, which were found to be in the same range for both the algorithms. The fixed detector algorithm showed better detection ability, but its use is limited by the number of detectorized links in the network, while the performance of the probe vehicle algorithm was dependent on the number of reports available per time period.



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The work reported in this paper is based on the independent Master of Science theses of the two lead authors.

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