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16. Abstract

A feasibility study of dilemma zone problems, performed by collecting and analyzing traffic flow data at a high-speed signalized intersection, showed that the maximum green extension or cutback needed to get a vehicle out of the dilemma zone is generally no more than 2 seconds. If we scan all vehicles on a link just a few seconds before the beginning of a yellow interval, we may be able to extend or cutback the green interval so that the vehicles can avoid the dilemma zone. For each vehicle approaching an intersection on the link that is about to turn yellow, there is a time interval such that (a) the vehicle will be in dilemma zone without green extension (or cutback) or (b) it will be in dilemma zone when there is T seconds of extension (or cutback). So the task is to find the smallest nonnegative integer T that is not in any of these time intervals and extend (or cutback) the current interval by T seconds. This T can always be found and assuming there are no other restrictions, dilemma zones can be avoided and the extension (or cutback) is done at most once for each green interval. Our simulation study, performed by modifying the source codes of NETSIM, showed that the signal timing generated by a bandwidth maximization program (PASSER-II) resulted in lower number of vehicles in dilemma zone than that generated by a delay minimization program (TRANSYT-7F). Additionally, the signal timing generated by the combination of the two programs, that is, by minimizing delay within the constraint of bandwidth maximization, resulted in even lower number of vehicles in dilemma zone than those generated by each program alone. The technique developed in this study can be implemented if the speeds and positions of all vehicles on the roadway can be recorded at small time intervals (e.g. 1 sec). Recommendations are made for implementing and testing the developed technique.

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