Aalto University
School of Engineering

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Urban traffic control in a connected vehicle environment

Title of the dissertation	Leveraging connected vehicle data for user-centred and equitable urban traffic control strategies
Contents of the dissertation	For many decades, urban traffic management systems have been vehicle-dominated. That is not only because of a lack of attention to users, but conventional data collection tools are powerless to collect individual vehicle data as well as vehicle users data. Connected vehicles (CV), as an emerging technology, can collect and transmit real-time vehicle and its users data. This ability facilitates the development of user-centred traffic management strategies in urban transport networks. However, there are some challenges yet to be addressed to convert raw CV data to efficient input for traffic controls. Moreover, achieving a fully connected environment is not possible in near future due to various limitations. Accordingly, this dissertation aims at developing a traffic management strategy based on CV data that improves user-related performance measures at signalized intersections In this dissertation, we research two vital aspects of traffic signal control which are signal timing optimization and data. For signal timing optimization, First, using CV data, we develop a user-based signal timing optimization strategy where the objective of the controller is to maximize the user throughput of a signalized intersection. Second, we present a user-based Transit signal priority strategy where the objective of the controller is to reduce users average delay and bus scheduled delay by providing priority for buses that are behind the schedule and with a higher number of passengers on board. Moreover, secondary effects of the current transit priority systems and the proposed transit signal priority are compared, by considering the concept of total social cost. In the data section, first, the impact of CV data accuracy on the performance of signal controllers is investigated. Second, we develop a data-driven vehicle estimation method to make limited CV data usable for a signal controller.
Field of the dissertation	Transportation Engineering
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