An Integrated Microscopic Bicycle Simulation Model Considering Non-lane-based Traffic Characteristics

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Abstract

Cycling as a mode of transport is currently on an upward trend as a practical and low-emission alternative to the car in urbanized areas. With increasing numbers of cyclists, questions arise about the capacity and the management of cycling infrastructure. Simulation models are useful to understand the unique riding behavior of cyclists. Bicycle flow and modeling research focuses on observing operational behavior through experiments and on adapting existing car and pedestrian models to bicycle traffic. However, many of these models lack realism as they do not take into account the specific movement characteristics and the high heterogeneity of bicycle traffic. This study proposes a bicycle model which describes the combined longitudinal and lateral microscopic behavior to better represent the natural flow of cyclists. By implementing non-lane-based behavior, it relaxes a constraint of existing models. From the simulation, we can derive situation-specific key macroscopic characteristics that are useful for traffic engineering, policy-making, and further research in this area.