Fast or forced to follow: A speed heterogeneous approach to congested multi-lane bicycle traffic simulation

Copenhagen is world-known for its large proportion of cyclists, forming a diverse group with a large variation of equipment and physical abilities. This leads to a considerable speed heterogeneity which needs to be taken into account when modelling the traffic on dedicated bicycle paths. Nevertheless, existing studies on bicycle traffic simulation have either neglected such speed heterogeneity altogether or modelled it by dividing cyclists into a few discrete classes ignoring the entirety of the speed distribution. This paper proposes an efficient bicycle traffic simulation model with continuously speed heterogeneous cyclists and corresponding congestion effects. Based on individual-specific desired speeds and headway distance preferences, the model shows realistic speed-flow relationships validated with on-site observations while being capable of delaying rapid cyclists more often than slower ones in moderate traffic flows. The scalability of the model allows it to be large-scale applicable for network loading purposes, and thus suitable for evaluating impacts of cycling related infrastructure investments.

General information
Publication status: Published
Organisations: Transport, Network and Route Choice, Department of Technology, Management and Economics
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Pages: 72-98
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Transportation Research Part B: Methodological
Volume: 127
ISSN (Print): 0191-2615
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
Original language: English
Keywords: Bicycle congestion modeling, Bicycle traffic, Fundamental diagram, Multi-lane traffic, Simulation, Speed heterogeneity
DOIs:
10.1016/j.trb.2019.07.002
Source: Scopus
Source-ID: 85068744897
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review