Modelling bicycle route choice in German cities – using MNL and a an open web-tool to simulate bicycle traffic

Stefan Huber1*1 Sven Lißner, Paul Lindemann, Klemens Muthmann2

1 Faculty of Transport and Traffic Science – Institute of Transport Planning and Road Traffic, Technical University Dresden, Germany
2 Cyface GmbH, Dresden, Germany

Abstract
Information on bicycle use and route choice is crucial for bicycle infrastructure planning. However, there is often no information on bicycle traffic in cities. Especially in small cities or municipalities, which lack resources for data gathering. This lack of information on route choice, which can differ from city to city, hampers the assessment of infrastructural measures.
Crowdsourcing approaches like the CITY CYCLING (CC) campaign can help to bridge the data gap. Using the CC smartphone app, cyclist track their daily routes via GPS within a time window of three weeks. Thus, more than 1 million GPS tracks in more than 1,000 cities in Germany have been uploaded 2019. The data illustrate the spatial distribution of bicycle traffic within cities. Beyond that, it can be used for route choice modelling. This firstly provides insights to city-specific bicycle route choice. Secondly, the models can be used for traffic simulation to answer questions like “where do cyclist ride if cycling infrastructure characteristics change?” Implementing the models in “bikeSim”, an open web-tool currently in implementation, can help simulating bicycle traffic considering infrastructure measures. Infrastructure characteristics mainly base on OpenStreetMap data.
The contribution illustrates the utility and capability of the approach for the city of Dresden (Germany). The analysis reveals that the GPS data of the CC campaign in Dresden mostly match with official cycling statistics (gender, age, distances, etc.). It further shows that route choice in Dresden strongly depends on different influencing factors (slope, type of bicycle infrastructure, type of surface and its quality, distance and max. speed of motorized traffic). The model (MNL) realistically reproduces bicycle route choice (accuracy ~80%). Using the MNL the web-tool “bikeSim” realistically simulates bicycle traffic within the city area. Data and technique can easily be transferred to any other city participating in the CC or similar campaigns.

Keywords: bicycle route choice, Germany, GPS data, open data, crowd-sourced data

* Corresponding author. E-mail address: stefan.huber1@tu-dresden.de