

International Scientific Conference on Mobility and Transport Transforming Urban Mobility,  
mobil.TUM 2016, 6-7 June 2016, Munich, Germany

## Evaluation of Munich's Cycle Route Planner Data Analysis and Customer Survey

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### Abstract

A convenient combination of pre- and on trip route information for cyclists are online routing tools. The Munich Transport and Tariff Association in cooperation with the Department of Environment and Health recently developed the MVV Cycle Route Planner. This online route-planning tool can be used either on desktop computers or on smartphones and covers the greater Munich region based on Open Street Map Data. It enables both users and municipalities to add information of cycle routes and other new bicycle infrastructure to the route planner and improve the system continuously. It provides a navigation and map service especially for the requirements of cyclists and can be combined with the use of public transport. This paper concentrates on three different research approaches. In a data analysis more than 130.000 single requests from April until August 2015 were examined with focus on the spatial distribution of origins and destinations in Munich and the suburban region. As a result, the demand and frequency of the user requests give a strong lead where cycle flows are to be expected and further infrastructure, like cycle super highways or improved cycle routes, needs to be considered. A customer survey of users and non-users revealed their mobility patterns and the actual use of the cycle route planner for trips to work or for leisure. The survey focused on usage and assessment of the cycle route planner itself. It further analyzed which means of transport are used for frequent trips and what the restrictions are so far, not to use the bicycle.

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Peer-review under responsibility of the organizing committee of mobil.TUM 2016.

*Keywords:* Bicycle; E-Bikes; Route Planning; Cycle Highways; Customer Survey

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## 1. Introduction

Bicycle Route Planners are a very popular and efficient tool to promote cycling, not only for tourist destinations in rural areas, but also for everyday cycling in urban agglomerations. In combination with the increase of online mapping tools and geo-information systems based on crowdsourcing, everyone on personal computers and smartphones can use these route planners. Although the development of reliable and coherent cycling route networks is a big challenge and also depending on the special needs and demands of cyclists, there is a growing number of cycle route planners for many cities and regions.

This paper is focusing on the MVV-Cycle Route Planner for the City of Munich, which has been developed by the Munich Transport and Tariff Association together with the Department of Environment and Health. It will give a brief overview about existing online-route planners and navigation tools for cyclists and then focus on the evaluation of Munich's Cycle Route Planner. In Munich there is a current lack of cycle traffic data. Only seven automatic bicycle counting spots, spread over the whole city, are counting the number and direction of cyclists. There is no current data available about cycle traffic flows, the modal share or the satisfaction of cyclists with the conditions of cycle tracks, for example. The last large-scale study, called MIDMUC, was carried out in 2008 and showed a modal split of 13.6% for cycling in Munich (LHM 2010). There are several developments in the cycle network in the past, which indicate that this number did presumably grow in the last eight years. The evaluation of Munich's Cycle Route Planner can help to deliver a current data input to quantify the bicycle traffic. It provides furthermore some evidence where the most important origins and destinations for cyclists in the city and the region are. Further research questions about recommendations to prioritize bicycle highways or enhance the existing bicycle infrastructure at certain locations will be discussed.

## 2. Literature Review

So far, web-based cycle route planners are only subject of rare studies, due to the very recent implementation of these routing programs in the last years. Nevertheless there are several studies and research projects about bicycle route choice, using available datasets and surveys. HUNT and ABRAHAM (2006) for example presented results of a questionnaire on the influences on bicycle use. They figured out that cycling in mixed traffic on streets is more exhausting for cyclists than on separate bike lanes. Cycling becomes less exhausting in mixed traffic, as the level of experience increases. Concerning the cycling facilities at the destinations, they found out that secure bike parking is more important than showers. WILLIS, MANAUGH and EL-GNEIDY (2013) give a broad overview about travel behavior and mode choice concerning cycling. They summarize the literature on social and psychological factors, which have an influence on the choice for cycling and make suggestions to increase the bicycle mode share. A study from the United Kingdom is investigating a route choice analysis of urban cycling behaviors using OpenStreetMap (OSM). YEBOAH and ALVANIDES (2015) examined GPS track data of cyclists using OSM and show the importance of consistent cycling networks, in order to support higher destination accessibility and increase the route directness. Besides comfort and route directness the attribute safety plays a significant role for cyclists, considering different route choices. SINGLETON and LEWIS (2011) are combining bicycle accident information with bicycle route planning, using the example of London. They analyzed the spatial locations where bicycle accidents occurred and drew a comparison between the quickest route and an accident avoidance weighted route. For a certain number of evaluated trips, they show that routes avoiding areas of high accident volume did not increase the trip length significantly. Another study from London has investigated the decisions that cyclists make when deciding which route to take (GLEAVE 2012). The key considerations around route choice of the cyclists centered on choosing the safest routes, and avoiding traffic. Less experienced cyclists prefer routes with less traffic and a cycle lanes, avoiding also confusing junctions.

Comparing distance-based routes and attribute-based routes BEHESHTITABAR ET AL. (2014) are presenting a bicycle route choice model that is based on a cost function. They tried to find out which parameters have higher influence on bicycle route choice, and how they were contributing. The resulting model is capable to predict the most probable path a regular commuter would take between two points located in a defined area. The model does not only find the shortest path for cyclists, but also prefers attributes for the most suitable route in terms of safety and comfort.

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