

Last Mile Connectivity: Understanding the Accuracy of Point-to-Point Navigation



by POORNIMA BADRINATH and OSKAR BAUMANN

Our project takes the form of an interactive web map that shows two sets of directions between any start and end points. Additionally, users can use a built-in feature to underlay relevant visual information such as wheelchair accessible places, stairs, or lit areas at night. Such data is available for the cities of Munich, Vienna, and Bengaluru.

Our motivation for realizing the project is based on the proposition that “the quality of the first/last mile part may determine the [traveler’s] overall satisfaction with the trip.” [1]

USAGE

We designed the website to be used in two ways. First, simply as a planning and decision-making tool to efficiently navigate and get from point A to point B.

And second, as an educational tool to engage with the concept of first/last mile. Last mile connectivity in navigation means seamless and precise directions door to door. This includes all modes of transportation and levels of accessibility of a given trip. Our project allows insight into the last mile issue by interactive comparison of directions provided by two different navigation services (OpenStreetMap and Mapbox). In that sense, we hope to convey to the users the impact of varying degrees of last mile connectivity in navigation.

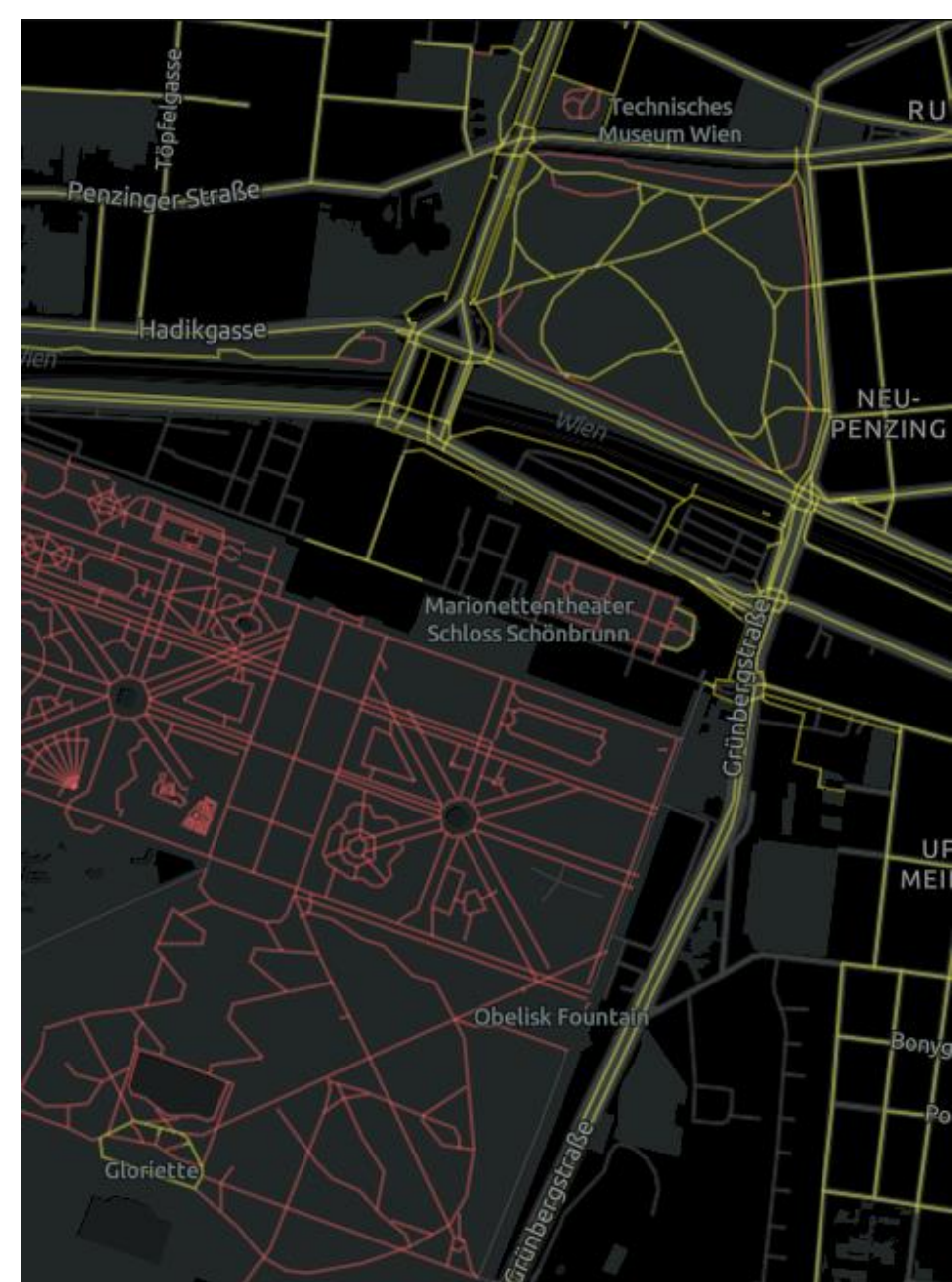


Fig 2. Activating the night mode changes map style and displays streets and footpaths illuminated at nighttime

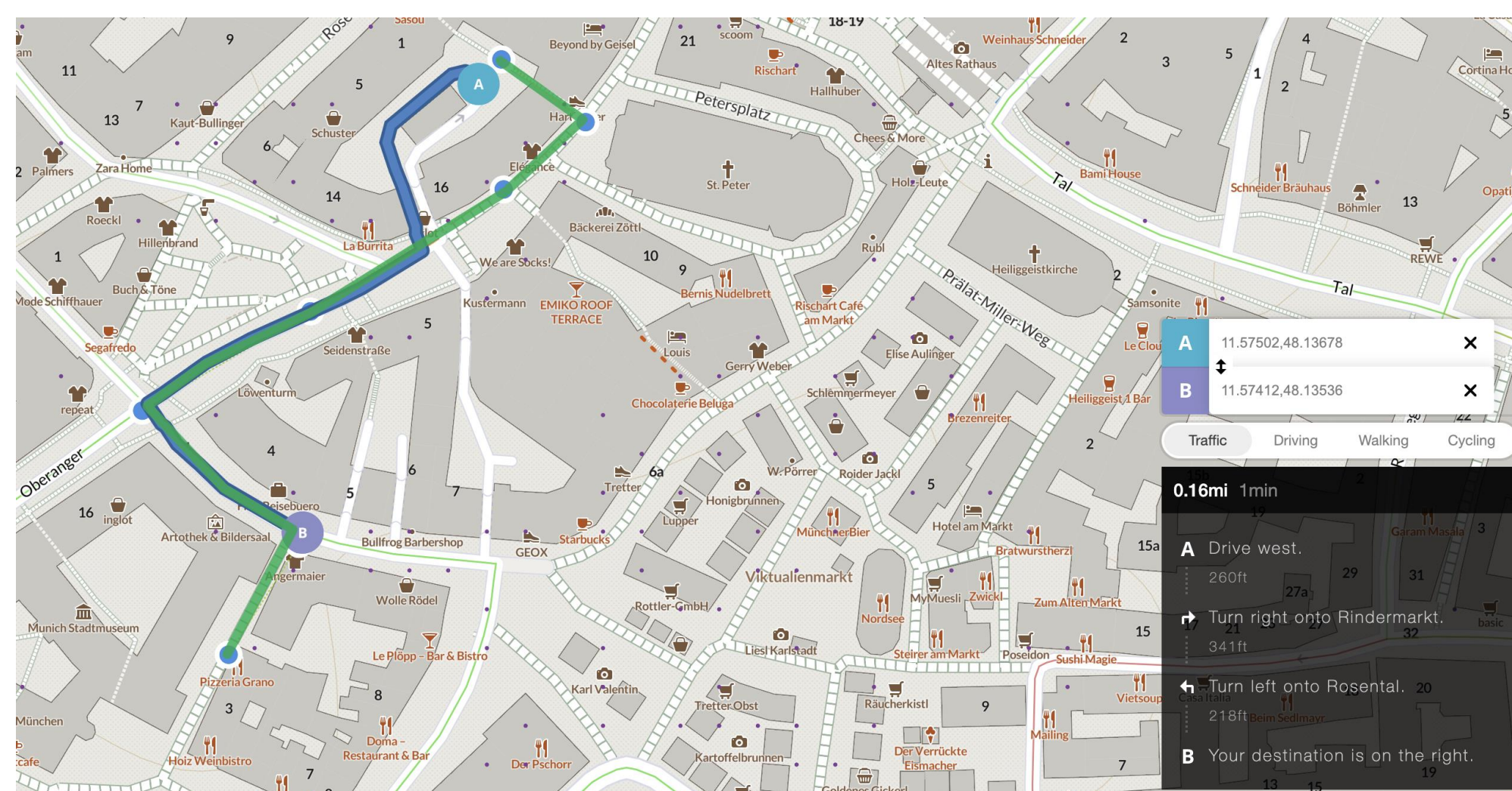


Fig.1 A screenshot of our web map, showing two different sets of directions (Mapbox Directions API in green, OpenStreetMap API in blue) to navigate from A to B, demonstrating the differences in last mile connectivity quality

GETTING DIRECTIONS

Both sets of direction given between origin and destination differ from each other. After the user’s first two clicks the optimal route based on the Mapbox Directions API appears in blue. The mode of transportation can be customized on the fly. The choices are driving, walking and cycling.

By clicking on the destination once more, the directions according to OpenStreetMap API appear in green at the top. This set of directions is limited to walking. The navigation service behind it can draw on more and up-to-date data, thanks to millions of worldwide contributors who continuously add missing information. Hence, its quality in terms of first/last mile connectivity is more qualitative.

MORE VISUAL INFORMATION

There are a variety of factors that contribute to navigation. These include time of day, available transportation, and accessibility constraints.

To help the users experience the impact of such factors on last mile connectivity and to improve navigational decision making, we provided additional datasets. Visual information about wheelchair accessible facilities and stairs can be displayed via mouse click. Plus, there is a feature to change the map style to represent the night. The streets or footpaths that are illuminated at night are highlighted in yellow and those that are not in red.

STYLING CHOICES

Our goal was to have a simplistic, slightly textured, memorable map design. The base map color palette is somewhat muted to make room for directions and datasets in vibrant colors to take prime visual hierarchy.

RESULTS

The individual elements and functions of the web map are well coordinated. However, the displayed directions do not take the datasets into account, so there may be obstacles in the suggested routes.

When testing and comparing directions in three different cities (Munich, Vienna and Bangalore) we found that the results vary greatly in terms of last mile connectivity. Our findings are that in Vienna and Munich, 70-90% of our tested routes had satisfactorily accurate navigation directions overall. In contrast, only about 20% in Bangalore did, probably due to missing accessibility data.

CONCLUSION

Continuous navigation all the way until the doorstep remains a complex problem. Our tool allows to interactively gain insight into these issues and the current limitations of navigation services. The foundation we have laid can be further expanded in the future to move from an educational tool more towards everyday usability.

IMPRINT

Mapping Project
Winter Semester 2021/2022
Technische Universität München

Oskar Baumann

Poornima Badrinath

SUPERVISORS

Juliane Cron, M.Sc.

Dr.-Ing. Mathias Jahnke

Edyta Bogucka, M. Sc.

KEYWORDS

interactive, web map, first/last mile, navigation, directions, transportation, modes, connectivity, accessibility

LINK

<https://poornibadrinath.github.io/accessibility/>

[Last Mile Connectivity! \(arcgis.com\)](https://arcgis.com)



REFERENCES

[1] Venter, Christo, Research in Transportation Economics, *Measuring the quality of the first/last mile connection to public transport*, September 2020

This project was created within the Cartography M.Sc. programme – proudly co-funded by the Erasmus+ Programme of the European Union.