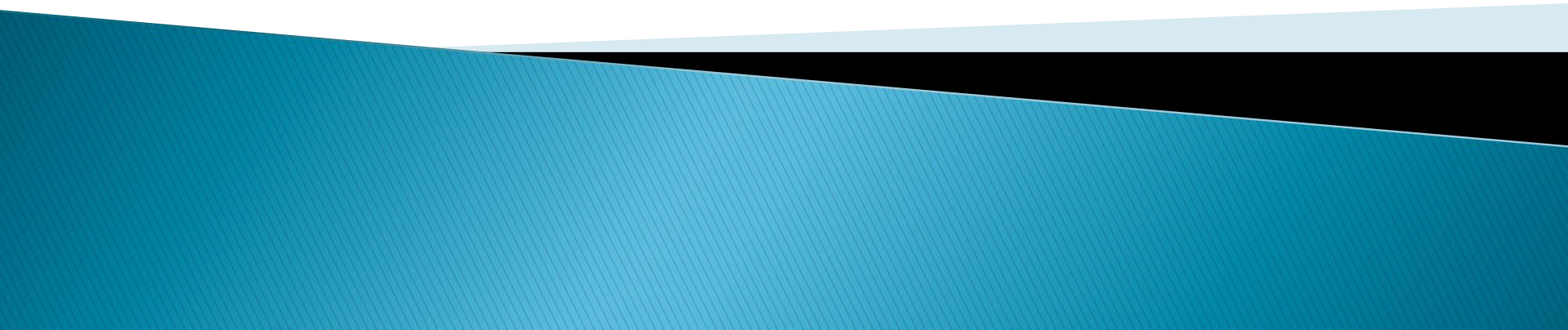# Context-Aware Search Spaces for Queries with Spatial Relations

Rick Gelhausen

Introduction

- Context-aware search spaces are search spaces that we consider correct for a given context.
- Setting the search radius for „hotels near cities" to 2km would not be context-aware.
- Making the search radius for „hotels near cities" dependant on the city size would be context-aware.
- Searching for „restrooms between countries" would be useless.

Motivation

- Web-mapping services are only using „near" and „in".
- Context-aware search spaces are represented by polygons.
- We introduce the new spatial relations „between" and the compass directions.

Implementation

- I created a toolbox for every useful query, written in C++.
- For every query the input is a couple of points, polygons or polylines and the output is a polygon.
- I also created a small website that allows the usage of the toolbox.

The „between" Relation

- We have clear boundary conditions.
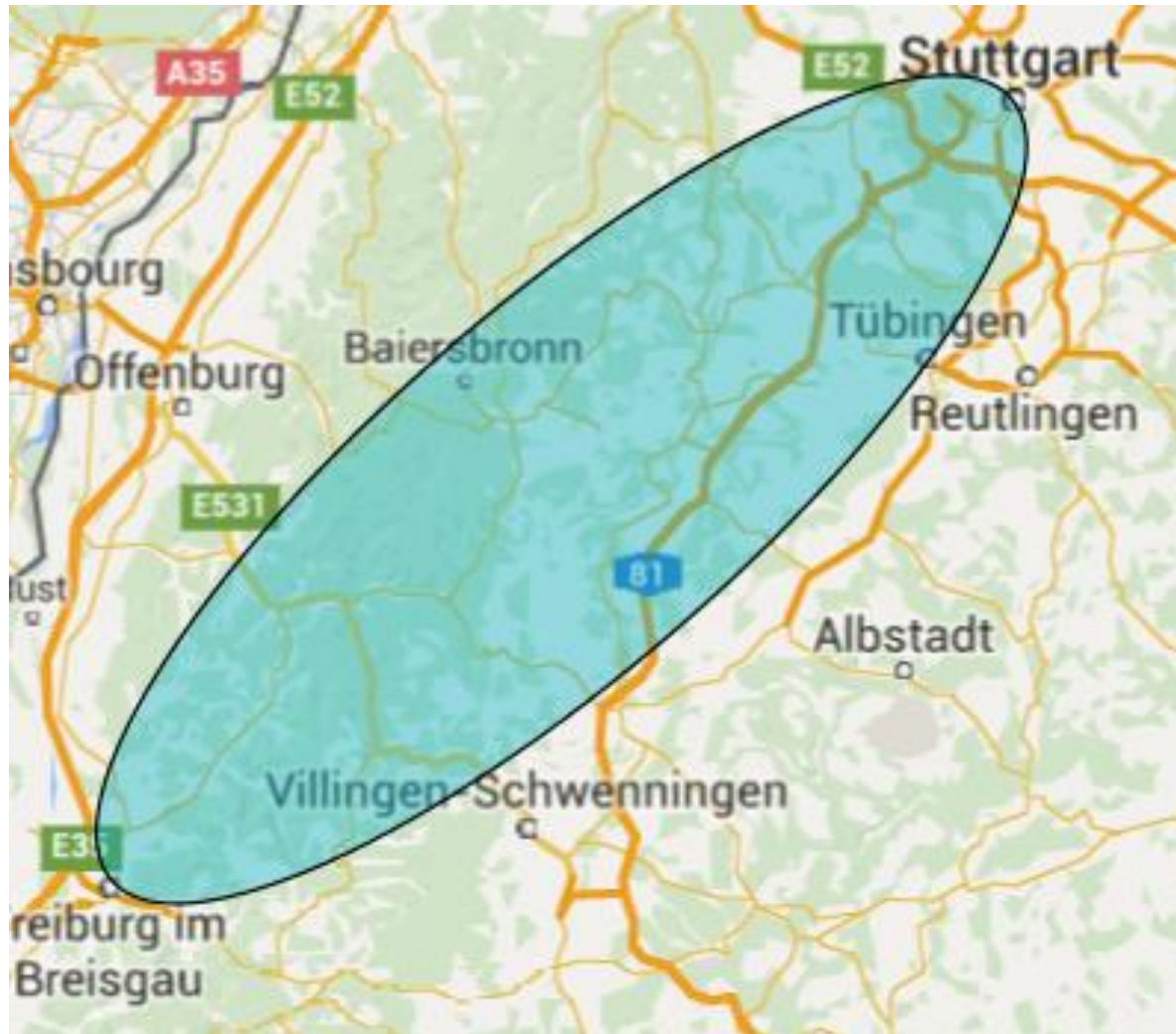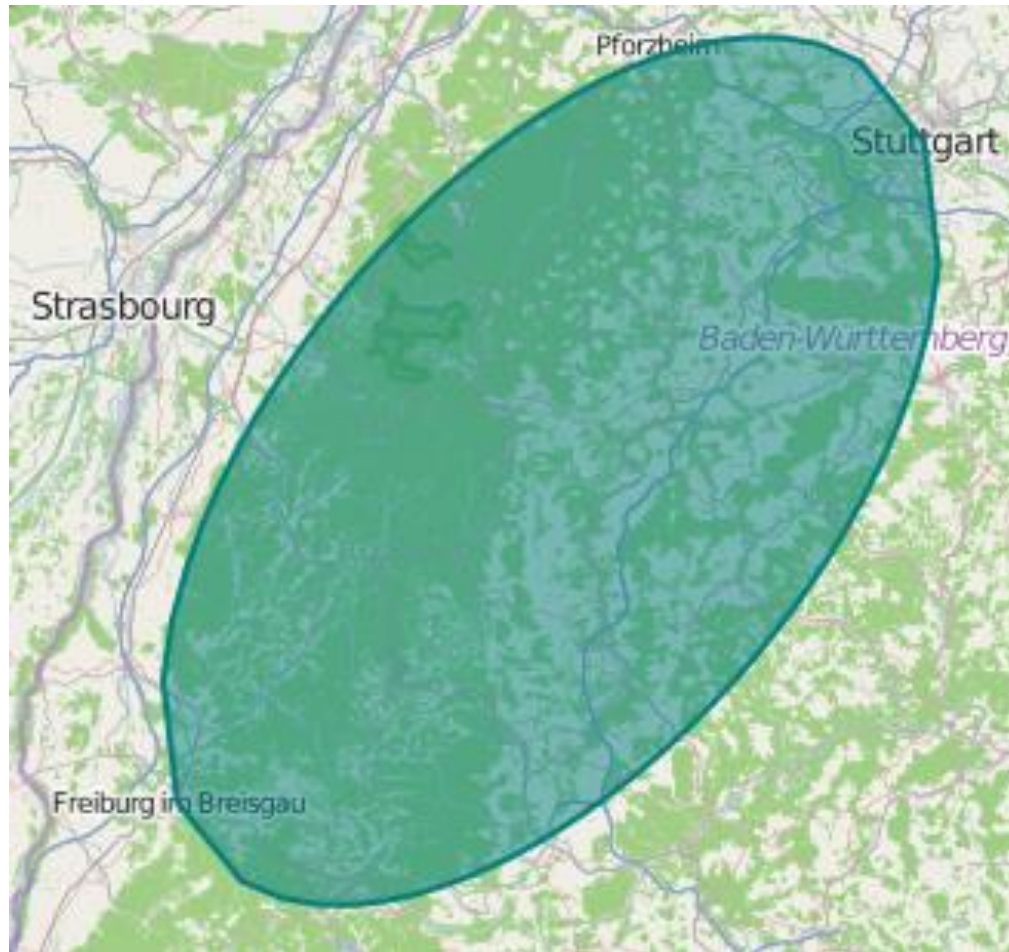- There are not many assumptions to make.

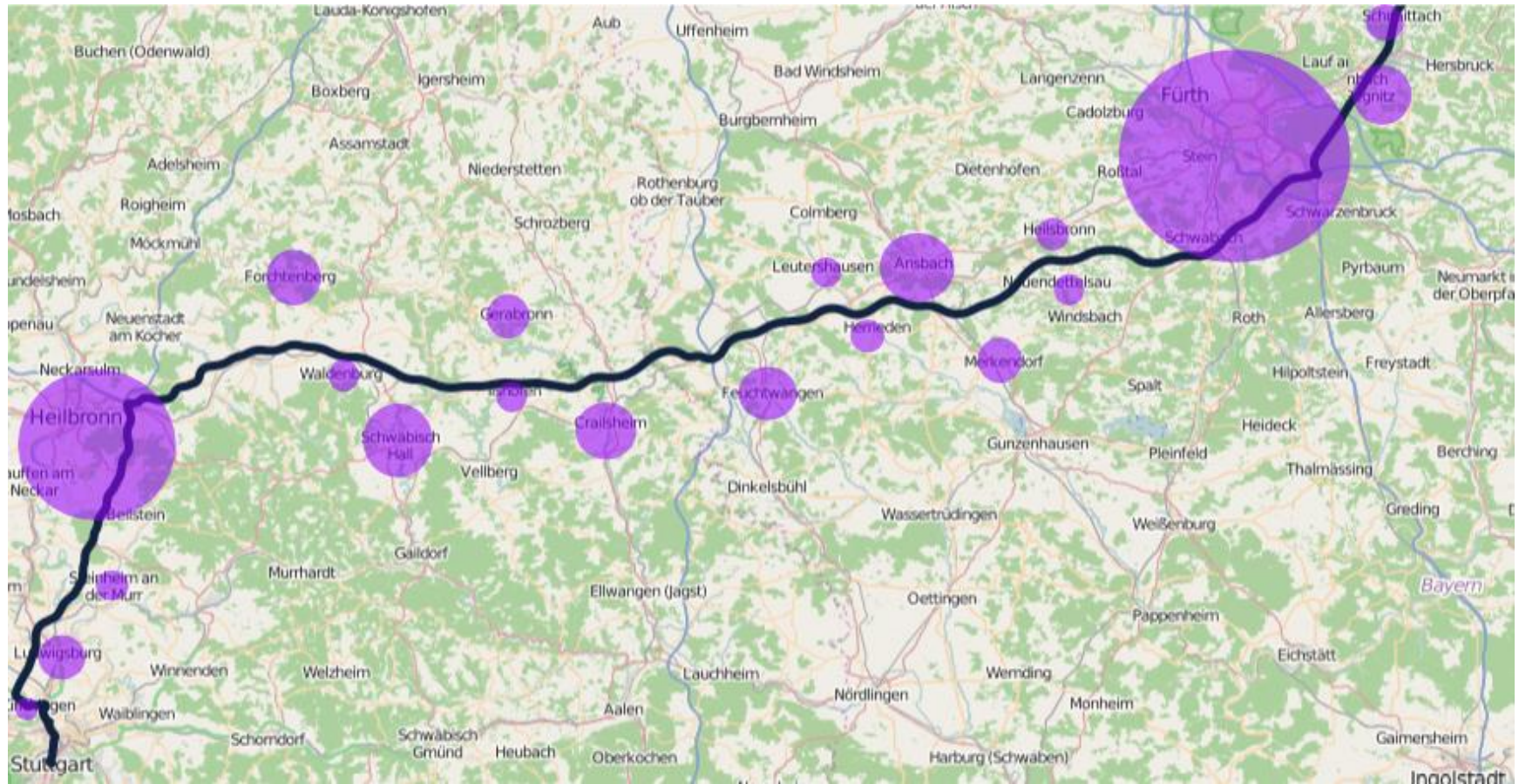# „countries between countries"

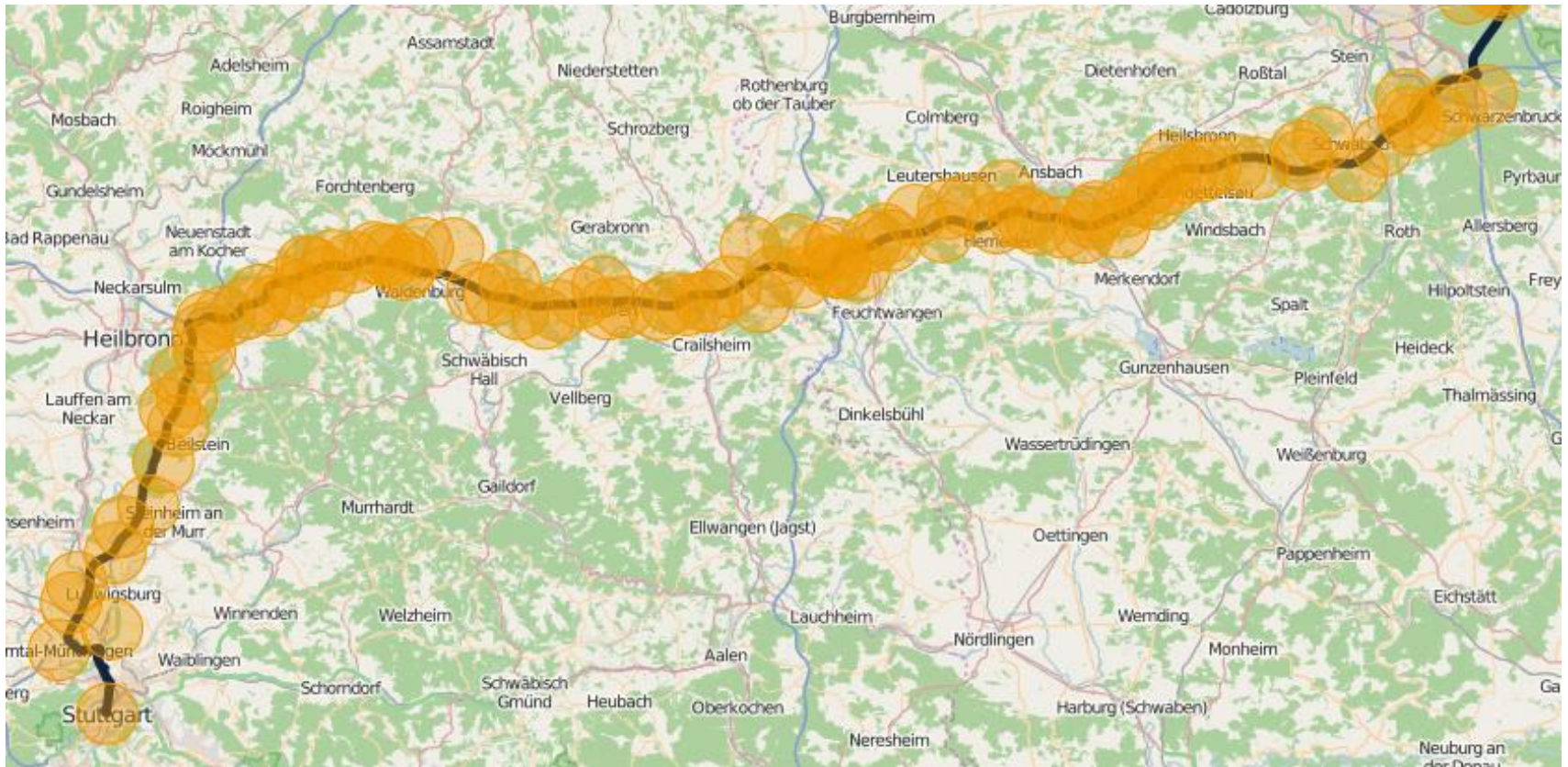# „countries between countries"

„cities between cities"

„cities between cities"
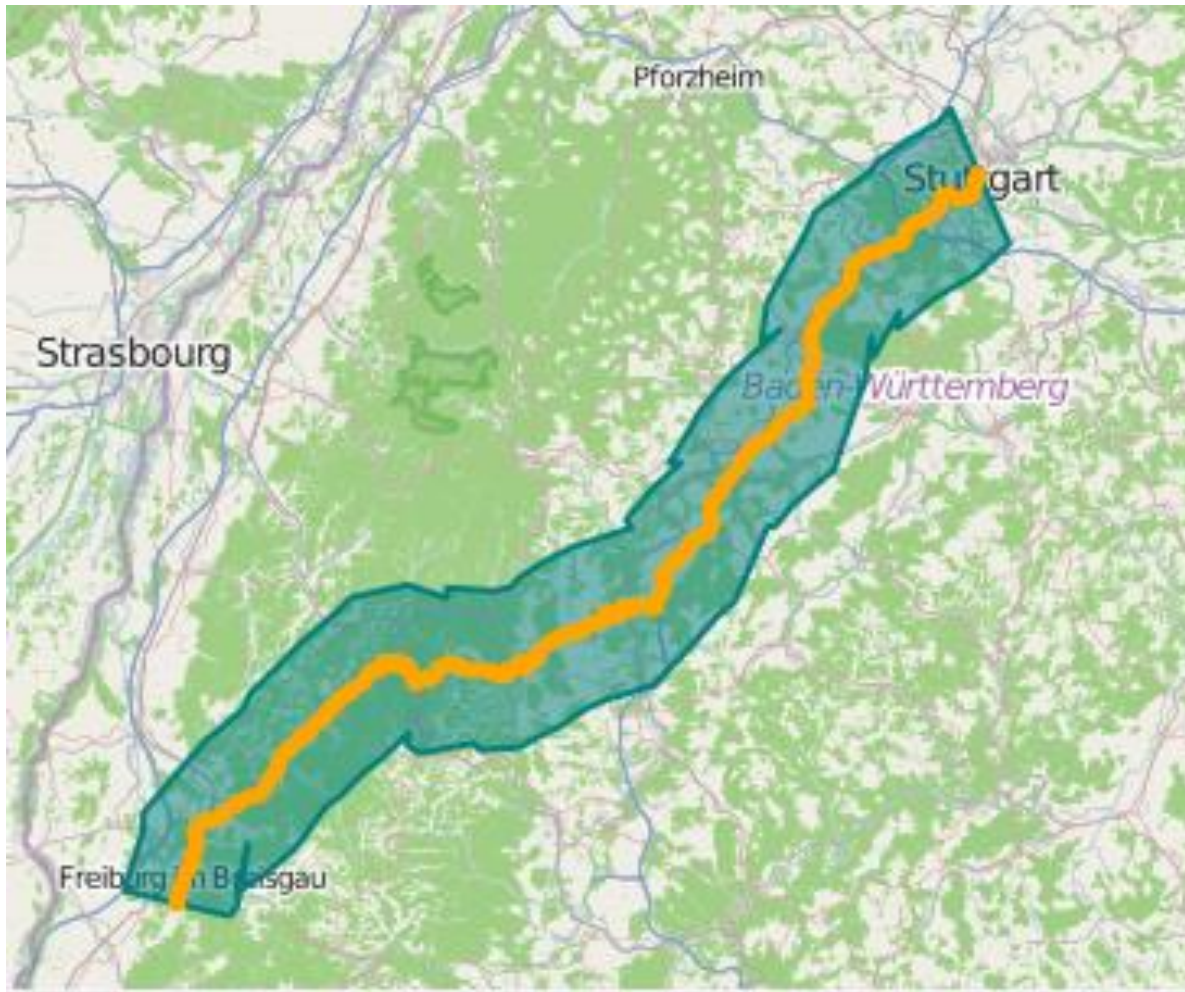
„hotels between cities"
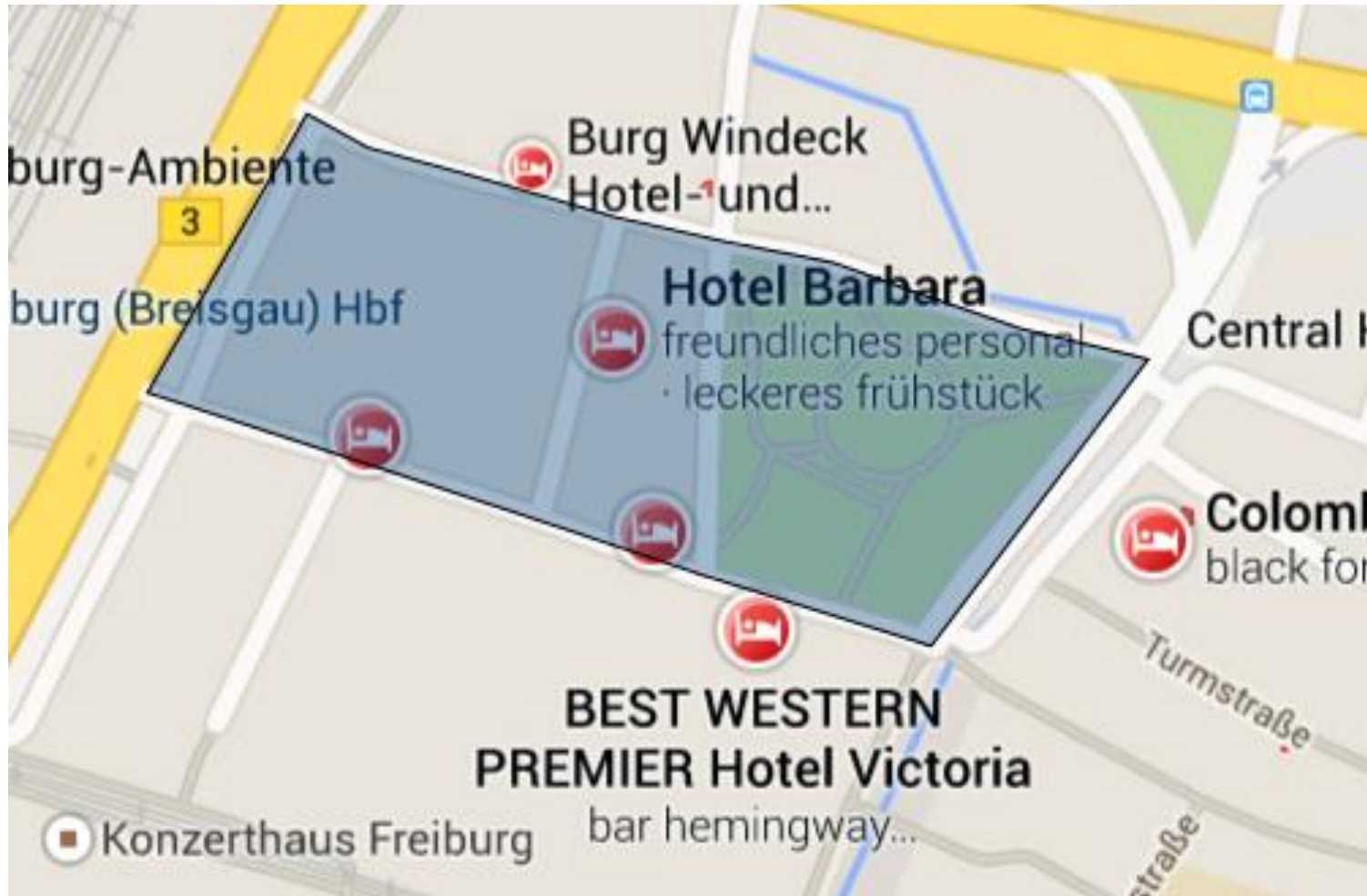
„hotels between cities"
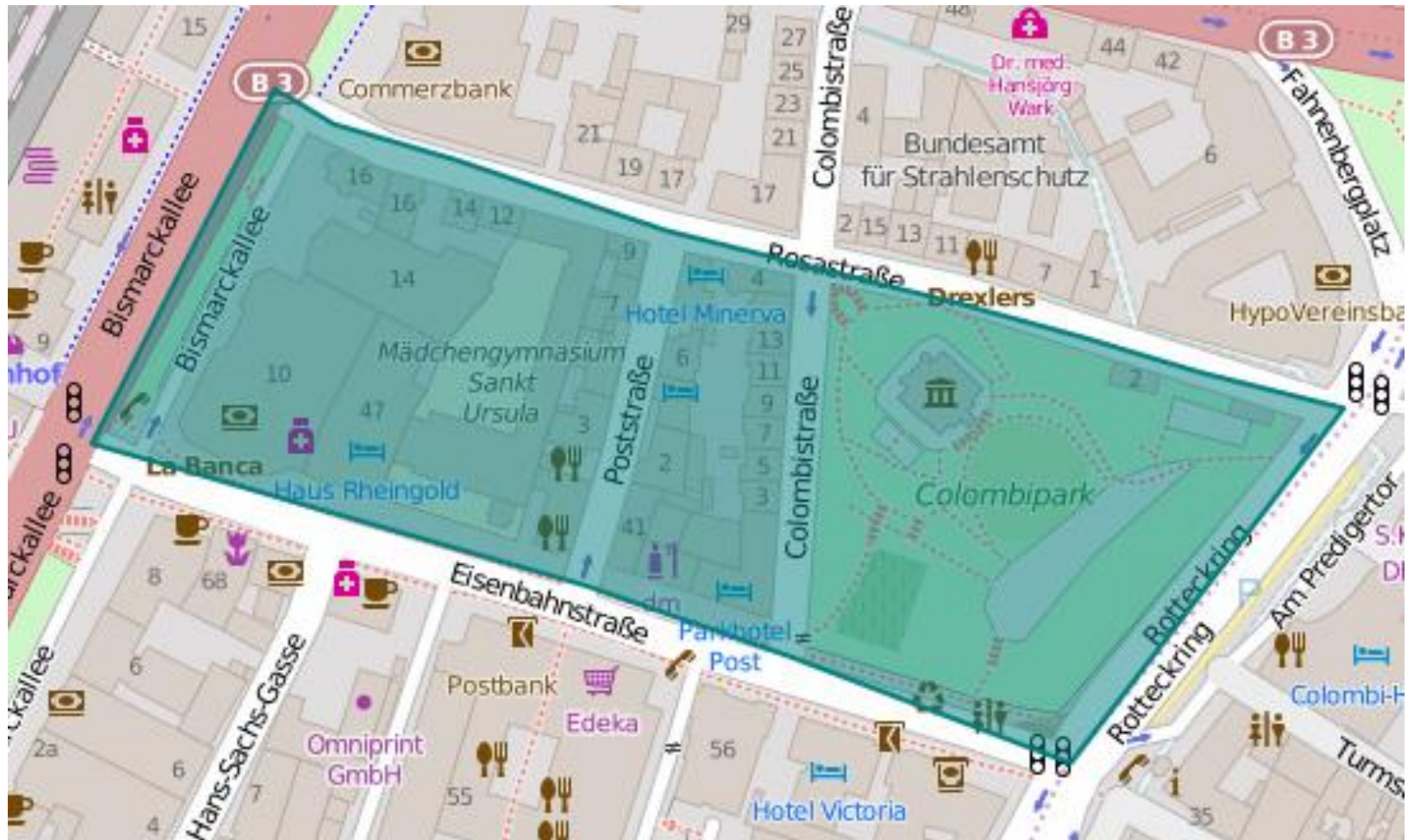
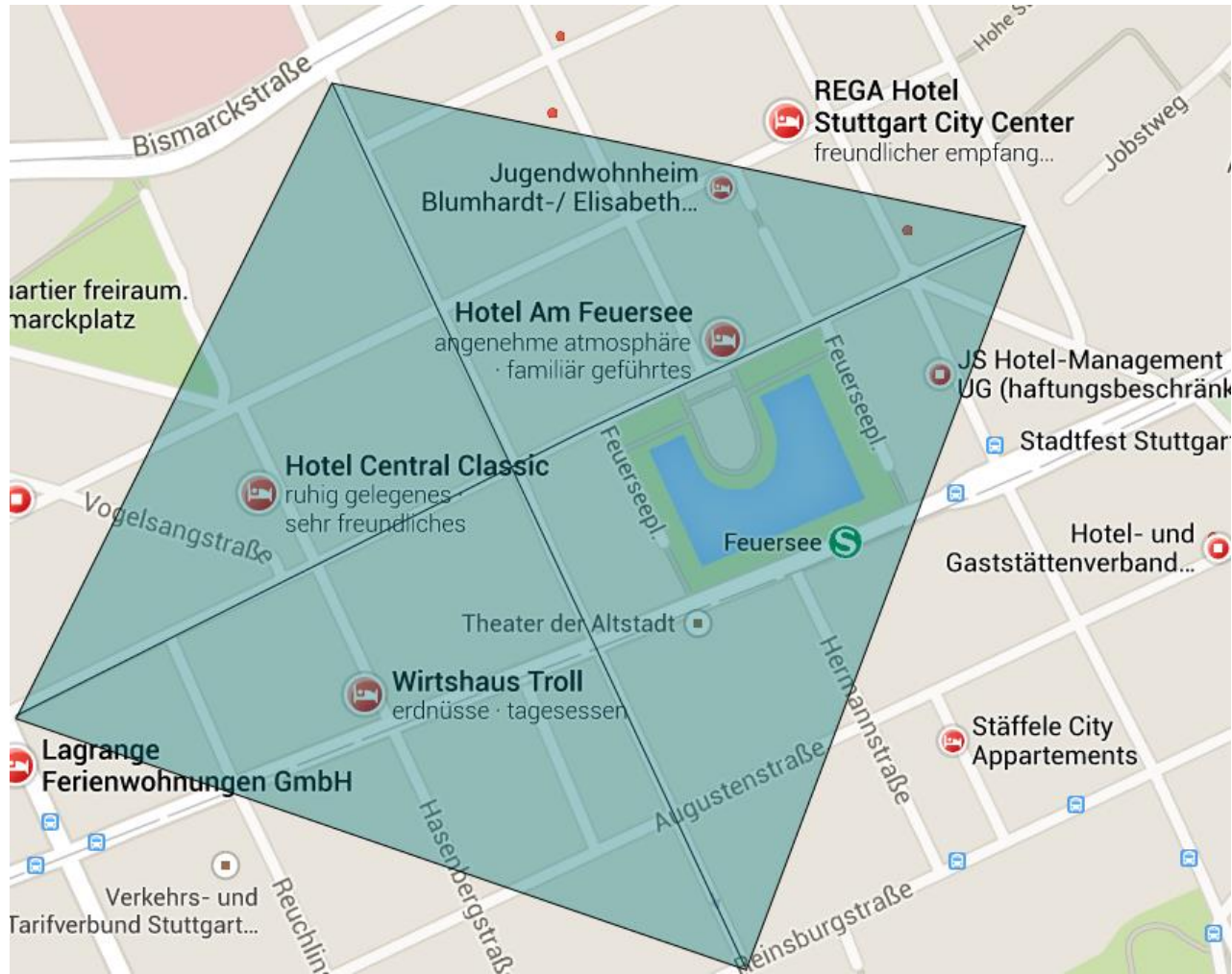# „gas stations between cities"

„gas stations between cities"

„hotels between streets"

„hotels between streets"

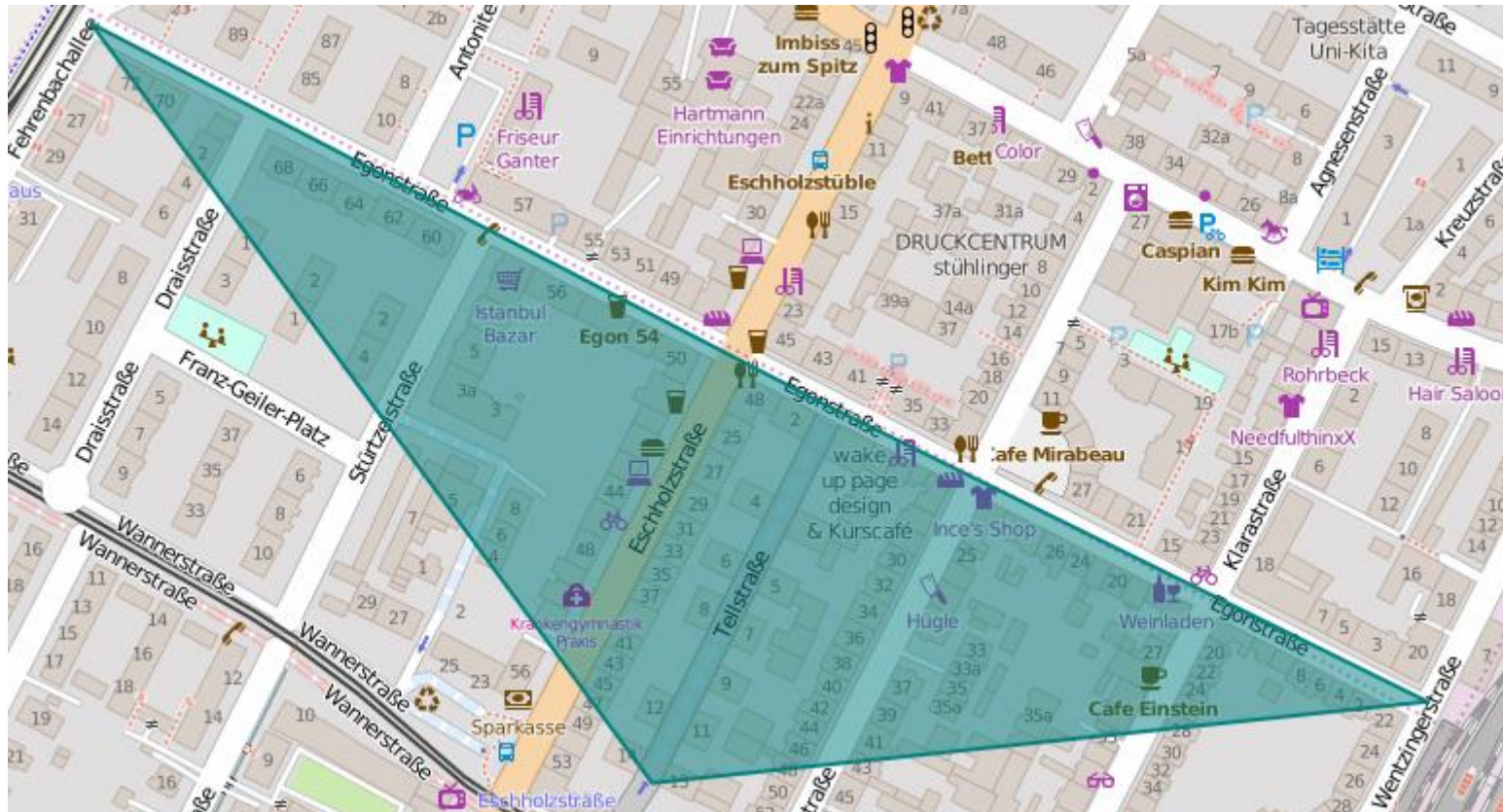# „hotels between streets"
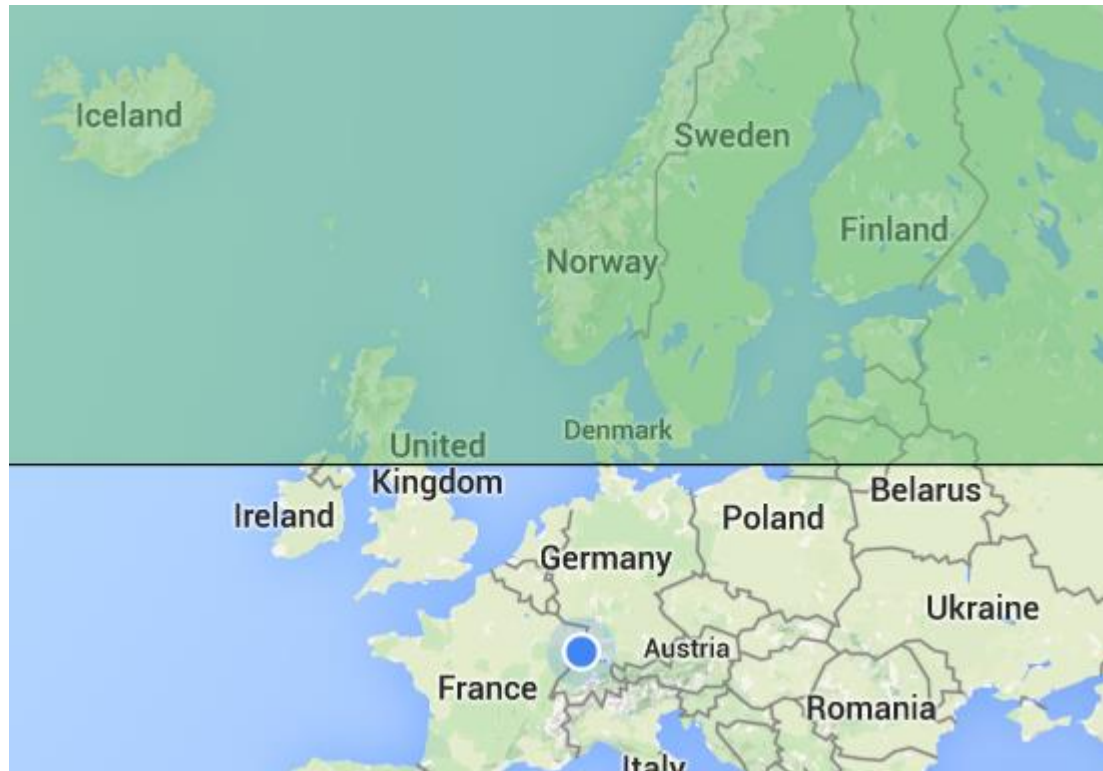
„hotels between streets"
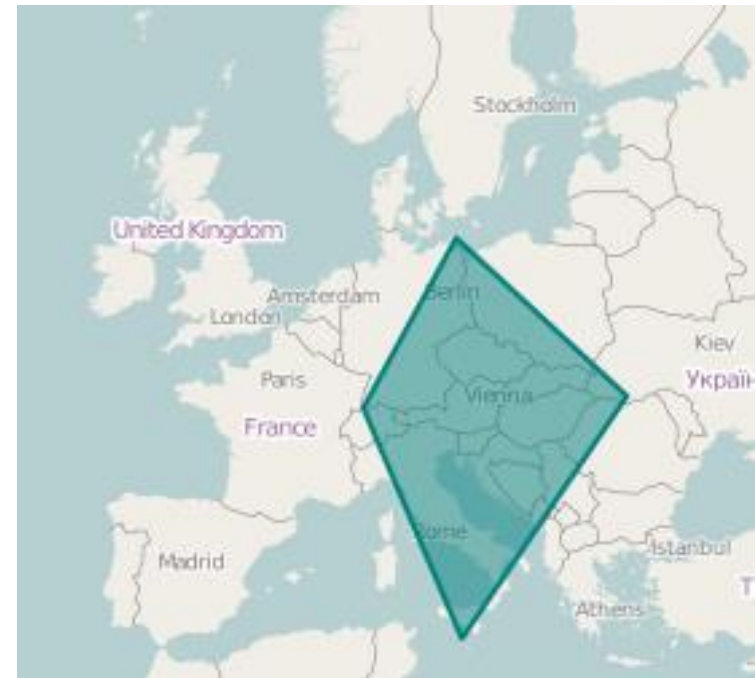
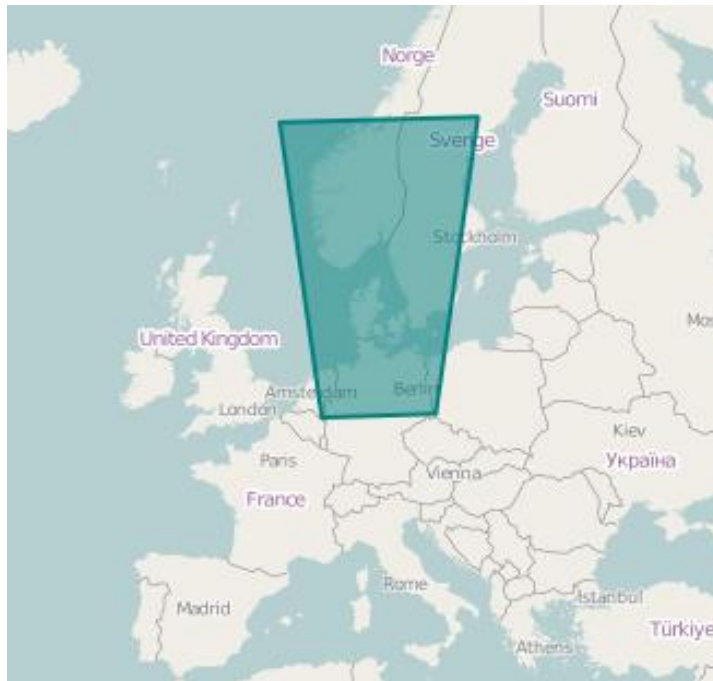# „hotels between streets"

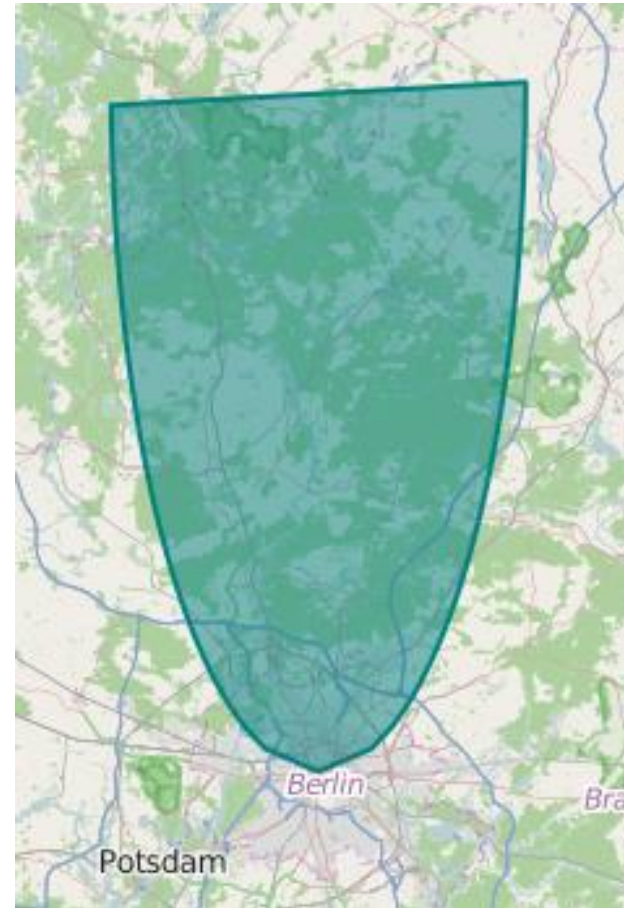# „hotels between streets"

Compass directions

- We do not have clear boundary conditions.
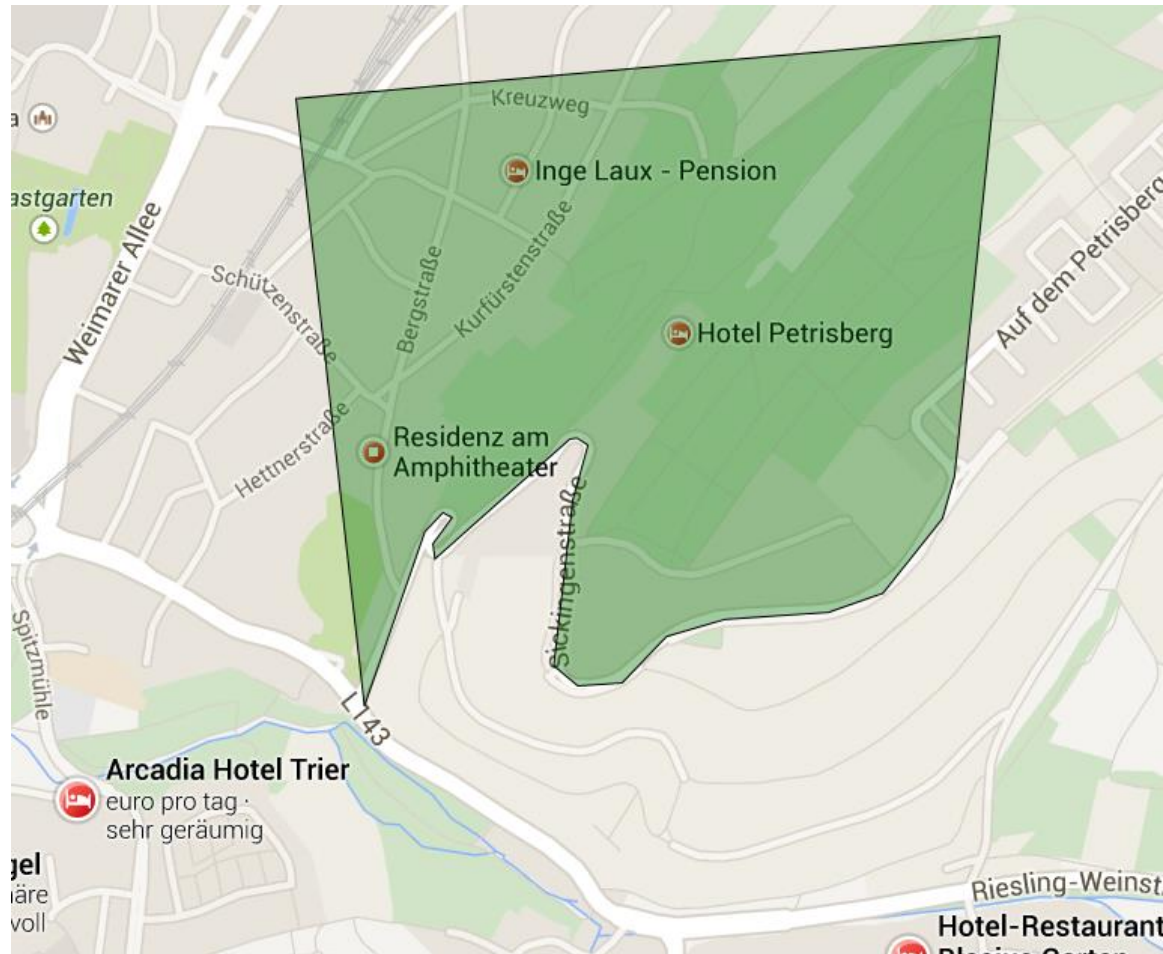- We have to make assumptions on many variables.

Examples for countries

„hotels north of cities"

„hotels north of streets"

„hotels north of streets"

„hotels west of streets"

Overview

"between"	country	city	street
country	quadrilateral	x	x
city	special case	ellipse	x
hotel	special case	ellipse or tube structure	polygon structure
supermarkets	x	ellipse	polygon structure
gas stations	x	tube structure	polygon structure
restrooms	x	x	polygon structure

compass directions	country	city	street
country	quadrilateral	x	x
city	x	semi-ellipse	x
hotel	x	semi-ellipse	polygon structure
supermarkets	x	x	polygon structure
gas stations	x	x	polygon structure
restrooms	x	x	polygon structure

Conclusion

- The results for the „between" relation are very satisfying.
- Most results for the compass directions are useful, but we have to conduct a survey to improve the results.
- The queries for countries in a compass direction are better solved using a non-polygon method.

Future Work

- conduct a survey to confirm the results
- improve the performance using e.g. databases
- create more spatial relations „near", „inside", „along"
- use the result polygons to improve web-mapping services

Thank you for your attention!

References

- Google. Google maps, 2004. URL https://www.google.com/maps/
- Open Street Map Foundation. Openstreetmap, 2004. URL http://www.openstreetmap.org/.