

eMaps

Fachpraktikum Algorithms on OpenStreetMap Data 19/20

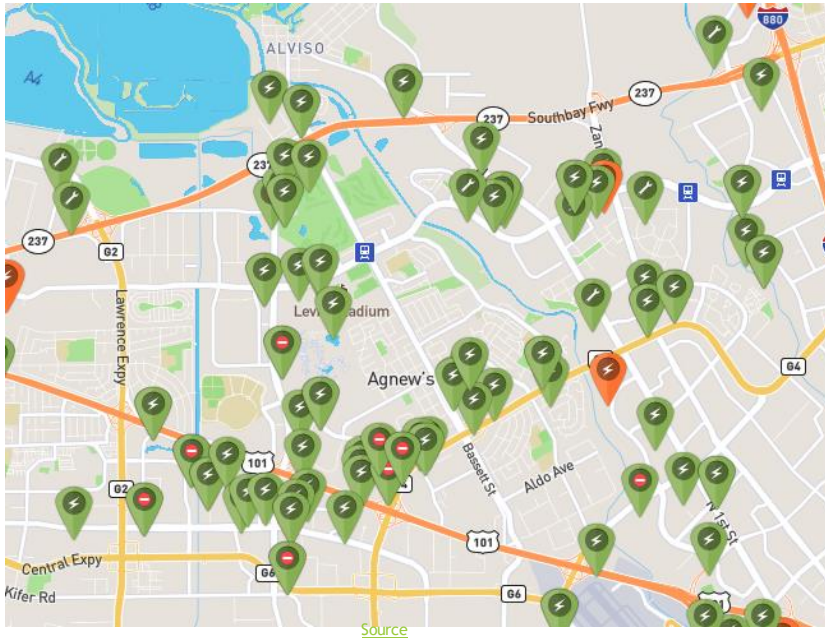
Motivation



Source

- ▶ Electrically-powered vehicles important in fight against climate change
 - ▶ Unique characteristics:
 - ▶ Limited cruising range
 - ▶ Long recharge times
 - ▶ May run out of power
- ➔ Adaption of route planners required!

Idea

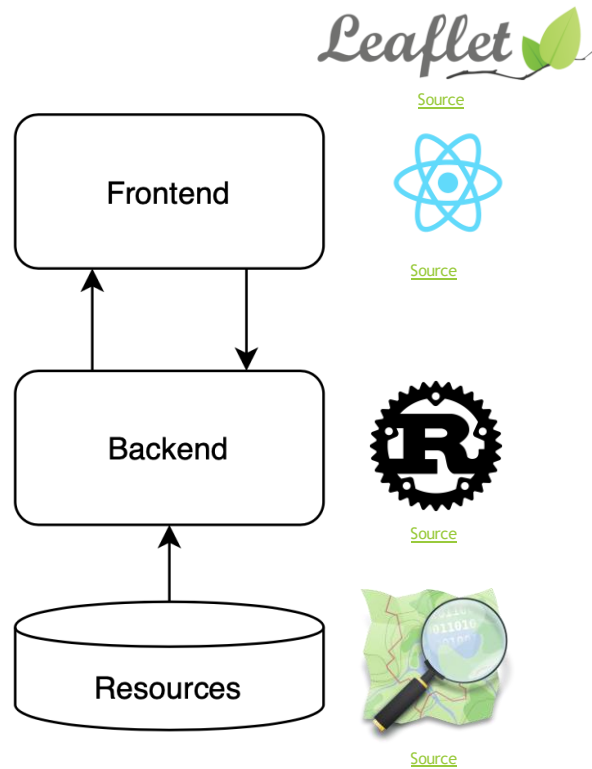


- ▶ Route planner for e-Vehicles
- ▶ Route planner should consider:
 - ▶ Current and maximum range of e-Vehicles
 - ▶ Availability of charging stations
 - ▶ Never running out of power

The background of the slide is a solid lime green. On the right side, there is a complex geometric design consisting of several overlapping triangles and polygons in various shades of green, ranging from light lime to dark forest green. Some of these shapes are semi-transparent, creating a layered effect. A thin, dark green line also runs diagonally across the right side of the slide.

► Live Demo

Architecture

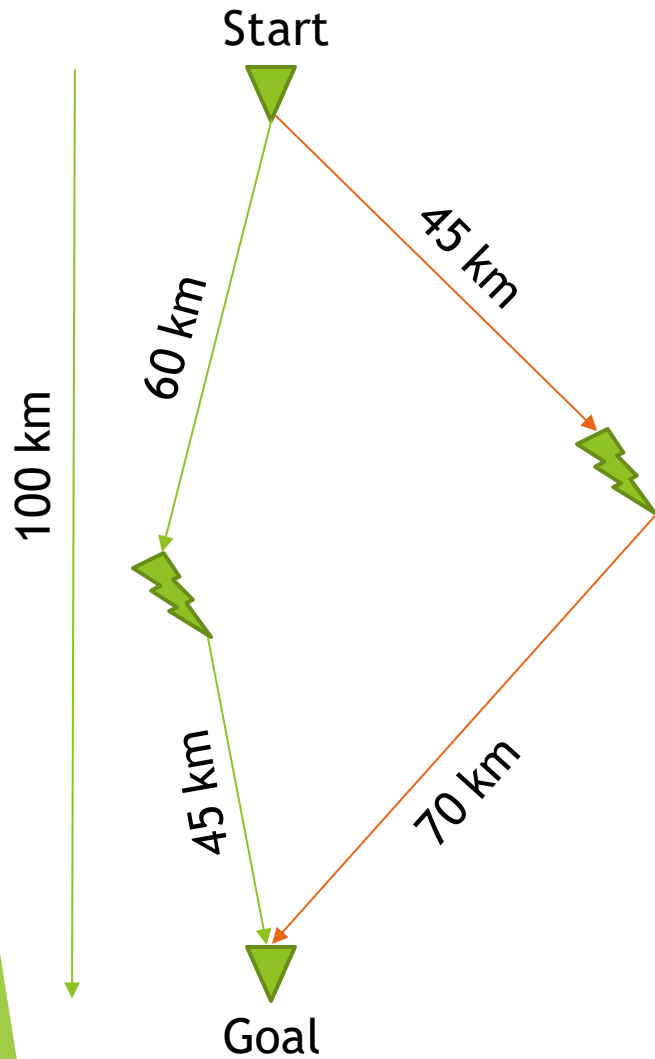


- ▶ Model-View-Controller
- ▶ Resources: Raw OpenStreetMap data in PBF format
- ▶ Backend: core functionality and API written in Rust
- ▶ Frontend: display map and routes using React and Leaflet

Key Concepts

- ▶ Parse amenities from OpenStreetMap data with `{amenity: charging_station}`
 - ▶ Parse vehicle supported by charging station, i.e. only Cars, only Bikes, or both
- ▶ Extend graph with charging station nodes
- ▶ Request for shortest path contains current and maximum range of e-Vehicle

Key Concepts



- ▶ Backend calculates distance of route
 - ▶ If distance within current range → return route
 - ▶ Else: calculate route with charging station(s)
- ▶ Calculate "optimal" charging station for current route
 - ▶ Start coordinates
 - ▶ Goal coordinates
 - ▶ Current range
- ▶ Set current range to maximum range

Key Concepts

- ▶ Calculate route with charging station
 - ▶ If distance from charging station to goal is within maximum range → concatenate route + return
 - ▶ Else calculate route to next charging station until distance from charging station to goal is within maximum range

Other features

- ▶ Search Cities, Places, POIs, ... via Nominatim API
- ▶ Show map of all charging stations

Limitations & Future Work

- ▶ Determining charging station/route not optimal
 - ▶ Extend edges by a weight representing the energy consumption
 - ▶ Consider elevation profile to determine more energy efficient routes

The background of the slide is a solid lime green. On the right side, there is a complex geometric design consisting of several overlapping triangles and polygons in various shades of green, ranging from light lime to dark forest green. These shapes create a sense of depth and movement, extending from the top right towards the bottom right corner.

► Thank you!