

Master Thesis / Semester Thesis

Conceptualization and Parametrization of a Truck Routing Profile for Realistic Routing

Motivation:

Commercial vehicles are significant contributors to greenhouse gas emissions within European road transport. Transitioning to battery-electric commercial vehicles offers one of the most effective pathways to achieving meaningful and sustainable emission reductions. This transformation aligns with the European Commission's ambitious goal to cut CO₂ emissions from heavy-duty vehicles by 90% by 2040. Additionally, the increasing number of companies requiring environmentally responsible supply chains reinforce the urgency of this shift. Especially long-haul electric trucks will have high demands on the public charging infrastructure and its availability. As charging stops on the route will be inevitable, precise scheduling and reliability in operation are of high interest for the freight forwarders. To meet those requirements, smart route planning and charge stop integration including reservation of charge points are promising ideas.

Thesis topic:

To enable smooth and reliable on-route charging, routing systems must provide accurate predictions of travel time, energy consumption, and route feasibility for heavy-duty electric trucks. This thesis focuses on the development of a customized vehicle routing profile for heavy-duty trucks using the open-source routing engine GraphHopper. GraphHopper allows the creation of specific routing profiles that incorporate vehicle characteristics and road network constraints. The objective of this work is to design and implement a realistic and representative truck profile that accounts for factors such as speed limitations, road category restrictions, and turn limitations that are typical for heavy-duty vehicles. A key component of the thesis is the use of real-world operational data collected from trucks over an extended period. This data will be analyzed and processed to extract relevant parameters for the routing profile. Based on this analysis, a methodology for parametrizing the truck profile will be developed and implemented. The resulting profile will then be evaluated and validated to assess its ability to produce realistic routing results for electric trucks. The outcome of the thesis will contribute to improving routing accuracy and supporting reliable route planning for electric freight transport.



Work packages:

1. Literature review on battery electric trucks and routing engines
2. Analysis and preprocessing of real-world truck data for further applicability
3. Development of a methodology to parameterize a custom truck routing profile
4. Implementation and parametrization of the truck profile in GraphHopper
5. Validation and evaluation of the routing profile

Requirements:

- Passion for e-mobility and energy-transition technologies
- Good programming skills in Python, Basics in Git
- Independent and strategic way of working
- Enjoy working in a team
- Very good German or English language skills

I look forward to receiving your application with a CV, current overview of grades (+ any other documents) and a brief motivation. I'm happy to discuss the topic with you in detail in a personal meeting. **The thesis can be written either in German or English.**

Contact:

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Start date:

From now on

Workplace:

FTM, Garching Forschungszentrum. The thesis can be done on site or remotely.