Master's Thesis

Development of a Relocation Algorithm for Autonomous Trucks in Transfer Hub-based Freight Transport

Motivation

Increasing climate protection requirements and a worsening shortage of drivers pose major challenges for logistics. One concept that addresses both problems simultaneously is a transfer hub-based freight transport, in which highway sections are handled autonomously, but drivers continue to transport goods to and from hubs near highways. By swapping trailers at the hubs, conflicting objectives with regard to range, payload and charging capacity of battery-electric tractor units can also be handled.

A simulation model for hub-based freight transport is currently being developed at the chair. However, one unsolved problem is the unequal number of trailers arriving and departing at the hubs, which requires a relocation mechanism for the autonomous tractor units.

Thesis topic

The goal of this thesis is the development of an algorithm that enables an optimized relocation of the tractor units so that the transportation flow at the hubs is always ensured. Possible approaches for this are machine learning, metaheuristics or linear optimization, which are to be examined in the thesis with regard to their suitability for the given application. As the algorithm is to be integrated into the existing simulation, it should be optimized in terms of computing time.

What you get

- The possibility to benefit from a pioneering role and to make your contribution for shaping the future of logistics

- The opportunity to implement your own ideas

- In case of outstanding work results: the opportunity to co-author a scientific paper
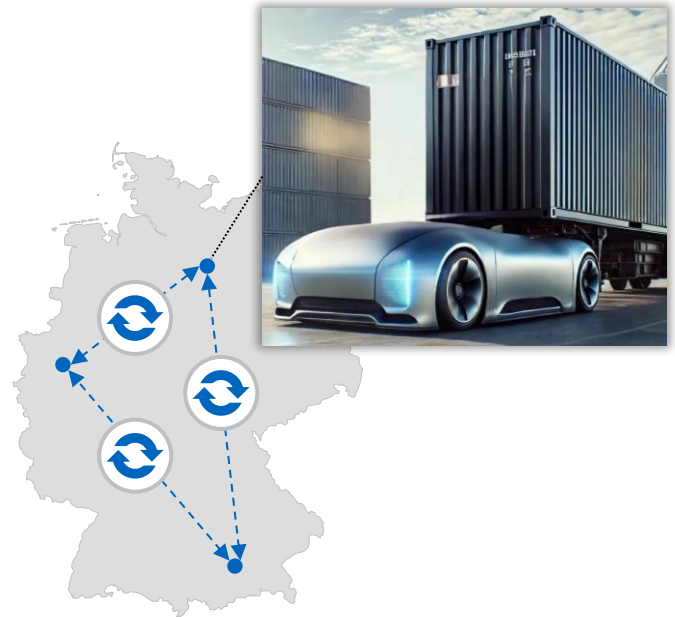
Work packages

- Literature research and identification of the state of the art as well as derivation of requirements for a relocation algorithm

- Development and implementation of a relocation algorithm and integration into an existing simulation model

- Validation of the selected approach, e.g. in the form of a benchmark

- Documentation and analysis of the results

Requirements

- High level of interest and motivation to drive the electrification and automation of the transport sector

- Programming experience in Python and/or C++

- Independent and structured way of working

- Very good knowledge of German or English

I am looking forward to receive your complete application with a CV, current overview of grades, a brief motivation, and any other documents. **The thesis can be written either in German or English.**

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Start date
From now
Workplace
FTM (Garching Forschungszentrum) or remote