TUM Hyperloop
TUM School of Engineering and Design
Technical University of Munich

FE-Simulation of Underground High-Speed Infrastructure and Track Alignment Accuracy

Type: Master Thesis
Content: simulative / CAD
Possible start: 01.05.2026
Key words: Guideway, Concrete Structure, Vehicle-Guideway Interaction, FEM

TUM Hyperloop

Our group is researching Hyperloop technology for passenger transport. We focus on electromagnetic levitation, suspension, and propulsion, as well as the simulation of high-speed aerodynamic phenomena, cooling systems, and topics related to vehicle structure and infrastructure. Depending on the topic, we develop new test benches and implement various experiments, computationally intensive simulations, or design new types of components. Our chair aims to motivate you and other students to develop modern technology for tomorrow, together as a strong team with the power of everyone.

Job Description

In this thesis, you will focus on the civil engineering challenges of underground high-speed infrastructure. A critical aspect of this system is constructing the guideway using the cut-and-cover method while strictly maintaining track alignment accuracy. Your primary objective is to investigate structural behavior using finite element (FE) simulations. You will simulate the construction process and analyze the structure under complex soil-structure interactions, focusing specifically on differential displacements at the structural joints to guarantee exact track geometry.

Your Tasks

- Simulate critical load cases, including ultra-high-speed vehicles, vacuum loads and thermal effects.
- Analyze the dynamic interaction between the vehicle and the guideway.
- Evaluate the structural behavior and optimize the design for the reference track.
- Document results and derive design recommendations for physical implementation.

Our Requirements

- Background in Civil Engineering, Structural Engineering, or a comparable field.
- Experience or high willingness to learn new finite element software (ANSYS)
- English, ideally also German language skills for communication and documentation.
- Perseverance to finish tasks with high reliability and on time.

Our Offer

- Working with students and researchers in a highly motivated young research team.
- Experience in a new field of research that is gaining importance.

Contact

If you are interested in working with our team, please send your application, motivational letter, and supporting documentation to Armin Kamberi (armin.kamberi@tum.de). If you have any questions, do not hesitate to contact us.