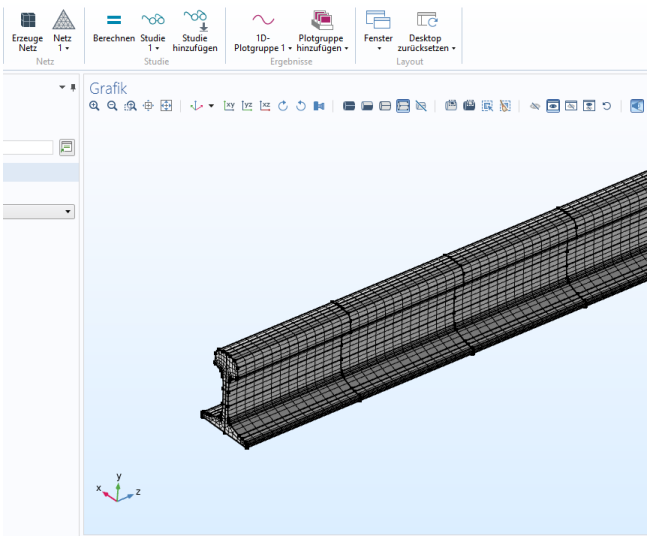
Chair of Vibroacoustics of Vehicles and Machines
TUM School of Engineering and Design
Technical University of Munich

Master Thesis

Developing a FEM-based model of the Track-Decay-Rate using Floquet-Bloch boundary conditions

Topic



In recent years, the noise disturbance of municipals became more relevant due to the noise remediation program by the Deutsche Bahn AG together with the legislator. One major source of railway noise is connected to the vibration of the rail tracks. Here, the so-called track decay rate allows engineers to measure and understand the dynamic behavior of the track, which gives additional insight to the sound radiation mechanism. However, experimental tests are time consuming and therefore cost intensive. Utilizing numerical models allows us to understand and analyze new track designs without having the necessity to build prototypes after each geometry change.
Therefore, such models are an interesting alternative within the field of virtual prototyping. With this work, an existing numerical model of a state-of-the-art rail track profile should be improved to compute the track-decay-rate. Since the model is very large, the aim is to investigate the applicability of Floqut-Bloch boundary conditions in order to minimize the numerical effort. With the improved model, it will be possible to design new rail track profiles and investigate the acoustic performance in an early stage of development. If outstanding results can be achieved, it is intended to publish the work in an international journal.

Tasks

- Improve the FEM-model to compute track decay rate
- Analyzing the possibility for applying Floquet-Bloch boundary conditions
- Model validation with full size model

Requirements

- High interest in cutting edge research
- High interest in theory, sound, vibration, wave propagation
- Solid knowledge of math and engineering mechanics

Additional Information

- Courses in dynamics, vibro-acoustics, computational acoustics, system dynamics beneficial

English or German language is possible for this work.

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