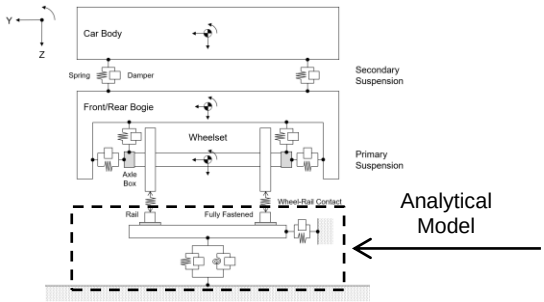
Masterarbeit zu vergeben

Dynamic Model Reduction of Flexible Ballastless Track Models with Damaged Rail Joints in Metro System

Dynamische Modellreduktion von flexiblen Feste Fahrbahn mit beschädigten Schienenstößen im Metrosystem

In related studies on the diagnosis of wheel and track defects, simulation-based approaches are being widely considered and are getting closer to reality through related technological advances. The structural coupling between wheelsets and track is the only non-linear part in the dynamics model and greatly affects the vibration responses. Their rigid bodies are generally replaced with finite element models to include the influence of coupled vibration modes. In this process, the direct integration of a finite element model into the dynamics model requires a large computational load and memory space due to its high degrees of freedom, and a reduced model obtained through the Craig-Bampton reduction method is widely used instead of a full model. However, there are still possible numerical problems, such as complex reduction process, high computational load, spatial aliasing, and inaccurate damage modeling, in reducing a full model while keeping its fundamental characteristics.

This study aims to analytically minimize the degrees of freedom of a flexible ballastless track model with damaged rail joints by using the combination of mass-spring-damper systems, not a finite element model. Target defects are structural damages at weld zone, rail-end, connector, and bolt. The main task is to build a library of analytical ballastless track models that include changes in structural stiffness and damping due to each damage and integrate them into the dynamics model. Methodologies for experimental verification should also be reviewed and compared in detail. Thesis work basically requires an understanding of multibody dynamics and vibration along with basic programming skills in Python.



Analytical Model

Ballastless Track

Prior knowledge of the following keywords is advantageous:
„Ballastless Track“, „Multibody Dynamics“, „Vibration“, „Model Reduction“

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