TECHNISCHE UNIVERSITÄT WIEN
Vienna | Austria

INSTITUT FÜR MECHANIK UND MECHATRONIK
Mechanics & Mechatronics

PhD student, project assistant, 40h

Topic: Modelling of a 3D frictional sliding contact

part of the research project: "Enhanced braking behavior of railway vehicles"
advertised at 04.10.2022

Keywords: modeling and simulation, friction, 3D contact, friction induced vibrations, self-excited vibrations, FEM, wear model, field tests, laboratory experiments

Motivation:
Railway mobility is a very energy-efficient way of transport. This is a fact of the small rolling resistance at the wheel-rail contact. A drawback of the steel-steel contact is the small coefficient of friction, resulting in smaller braking forces. Together with the large mass of a railway vehicle and especially for low adhesion conditions (moisture, leaves, etc.) long stopping distances are an inherent consequence. To avoid overrunning stopping signals and in unforeseen or emergency situations, additional braking systems to the regular wheel brakes (e.g. disc brakes) are deployed. Those can be divided into:

- systems, that are able to modify the wheel—rail frictional contact conditions, e.g. sanding system
- brakes, which are independent of the wheel—rail contact, e.g. magnetic track brake

To enhance the braking behavior of railway vehicles all braking systems shall be combined to optimize the global braking performance. To investigate the interaction of all braking systems, fundamental understanding of each subsystem is necessary. Several open questions referring to the magnetic track brake and sanding system still require basic research, in particular to understand and model the **frictional contact**, the **magnetic attraction**, the **dynamic/vibrational behavior** involved at braking. Experiments (field tests, test-rigs at laboratory conditions) will be performed as well to identify basic phenomena and to parameterize developed models.

Task description
As part of the described project, the task of this position is the basic investigation of the **frictional contact**. The aim is the development of a **transient friction and contact model** to predict and derive **effects from changed frictional conditions** on the transferred forces to understand the influence of **contaminations** (water, leaves, etc.) and **friction modifiers** (e.g. sand), and possible cleaning and reconditioning effects. Influences on **friction induced vibrations** while sliding over complex 3D-geometries (as it occurs at switches and crossings) shall be investigated. Further, a **wear model** shall be introduced and evaluated in a qualitative manner. The fundamental investigations **will be published in scientific journals** and presented at scientific conferences.

Your profile

- Completed university studies, e.g. mechanical engineering, physics, mechatronics or related fields
- Advanced knowledge of the subject area: mechanics and multibody simulation
- Interest in research in the subject area
- Programming skills with Matlab und basic knowledge in MBS/FEM-software
- Basic knowledge of tribology (preferable)
- Independent-minded and high level of motivation and commitment

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- Full-time position in a multi-year research project with a diverse and exciting range of tasks
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- Additional benefits for employees in the TU Wien

Interested in more information? Please feel free to contact us!

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