

## Masterarbeit zu vergeben

### Transfer Function model identification for the vehicle-track interaction system and characterization of the frequency response of the railway vehicle

### *Identifizierung eines Übertragungsfunktionsmodells für das Fahrzeug-Gleis-Interaktionssystem und Charakterisierung des Frequenzgangs eines Schienenfahrzeugs*

To develop a Fault-Detection and Isolation (FDI) algorithm which allows to successfully recognize failures in the railway track-vehicle dynamic interaction, it is necessary first to have a reliable characterization of the system to be analyzed. A Transfer Function (TF) is a linear mathematical model that describes the input-output dynamical behavior of a system around an operation point in the frequency domain. The knowledge of the transfer function of the system allows to predict the output signal for any given known input.

Moreover, the determination of a TF is a necessary step to characterize the frequency response of the system, i.e., its filtering properties and the relationships between the input-output signals for different frequencies. There are several methods to obtain a TF model of a system, from direct mathematical modelling and system identification algorithms to experimental techniques and input-output data- and signal-based techniques.

*Von Vorteil sind Vorkenntnisse:  
Systemtheorie, Systemidentifizierung,  
Programmierkenntnisse in Matlab und Latex*

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For the proposed master thesis, acceleration measurements of a railway system could be provided. If the acceleration signal measured at the axle-box or bogie of a train is considered as the input and the output is the acceleration measured on-board the train, it is possible to find a TF which could explain the system between these two signals, i.e. the suspension of the train.

In order to know which measurement dataset will be useful to detect a specific fault of interest, it is also necessary to identify the frequency range which is associated to this fault. Therefore, a time-frequency domain characterization for several track irregularities is also proposed.

