Track Quality Assessment with focus on Vehicle/Track Interaction

Invited Lecture - University of Porto

22/23 June 2017, Porto

Bernd Luber, VIRTUAL VEHICLE Research Center

Abstract / Content

At the beginning of this lecture, an overview of current research topics at VIRTUAL VEHICLE Research Center – Department Rail Systems will be given. The department follows the so-called 'whole rail system approach' to investigate vehicle dynamics issues, wheel/rail wear and damage phenomena, maintenance issues, etc. In this lecture, special focus will be laid on "track quality assessment taking into account vehicle/track interaction".

Testing of the running characteristics of railway vehicles as well as the maintenance process of European infrastructures require an assessment and classification of track geometry irregularities. In both cases the track geometry quality assessment methods defined in European Standards are unsatisfactory. The reason is that the vehicle track interaction caused by the deviations is not taken into account by these defined methods. The increased interaction could lead to a reduction in ride comfort and driving safety as well as an increase in maintenance costs of the overall system.

In this lecture, an alternative approach, the so-called Empirical Transfer Function (ETF) method is discussed. This method takes vehicle/track interaction into account through the inclusion of the dynamic behavior by using empirical transfer functions. The empirical transfer functions are calculated on the basis of a non-parametric system-identification method. The application of the ETF method provides load factors regarding dynamic track loading and running safety. These factors can be used as the relevant quantities for the assessment and classification of track geometry irregularities. The analysis of the results shows the consistent superiority of the ETF method over the current European Standard methods. This yields a great potential for both vehicle manufacturers and infrastructure managers to use a single common assessment method.

At the end of this lecture, a short overview of future research topics (e.g. monitoring, diagnosis and prediction of vehicle/track interaction) will be presented.

Short CV "Bernd Luber (PhD)"

Key Researcher at VIRTUAL VEHICLE Research Center, MSc degree in Electrical Engineering (Graz University of Technology); PhD in the field of railway track assessment based on vehicle-track interaction (Technical Sciences, Graz University of Technology); since 2004 at ViF in the field of vehicle-track interaction (simulation, measurement, monitoring and diagnosis); lecturer at Graz University of Technology (Vehicle-Track Interaction of Railway Vehicles); lecturer at University of Applied Science Graz (Railway Vehicle Dynamics); reviewer for several journals (e.g. Vehicle System Dynamics; Rail and Rapid Transit; Measurement).