Järnvägsgruppen

Invitation to KTH Railway Group seminar (+lunch)

When: Wednesday 4 December 2019 at 09.15-11.50

Where: KTH, Teknikringen 8, ground floor, Vehicle Engineering Laboratory

09.15-09.30	Coffee etc
09.30-09.35	Welcome
09.35-10.00	Wendi Löffler and Mats Bengtsson: *Towards train positioning using digital signal processing methods*
10.05-10.30	Rocco Libero Giossi, Rickard Persson and Sebastian Stichel: *Gain scaling for active wheelset steering on innovative two-axle vehicle*
10.30-10.45	Information from the Director
10.45-10.55	Break
10.55-11.20	Simon Iwnicki, Maksym Spiryagin, Colin Cole and Tim McSweeney (editors): *Handbook of Railway Vehicle Dynamics (2nd edition)*
11.25-11.50	Freddie Theland and Jean-Marc Battini: *Traffic induced vibrations in buildings on piled foundations*
11.50	Lunch

For participation in the seminar and lunch, please no later than 29 November inform Mats Berg by accepting this Outlook invitation.

Welcome!

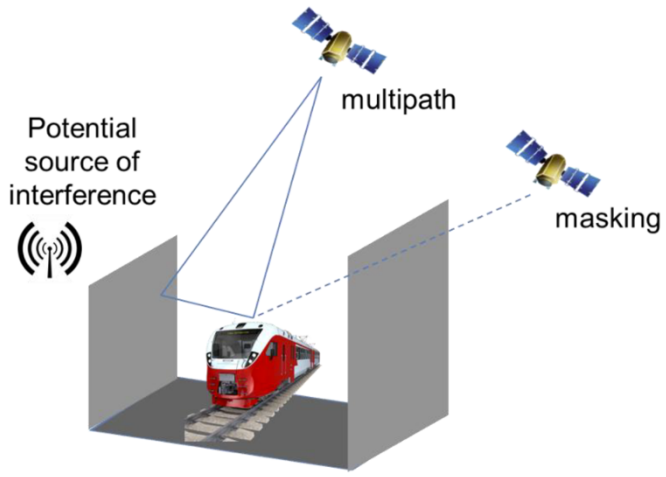
Sebastian Stichel and Mats Berg
2019-11-22

Towards Train Positioning using Digital Signal Processing Methods

Wendi Löffler
KTH, EECS school, Division Information Science and Engineering

Current trends in railway industry point to developing systems where short trains are travelling at high frequency while freight traffic is shifted from road to railway.
In achieving this goal, determination of train positions within a railway network that is fail-safe and of high accuracy is an essential task to solve. To greatly improve accuracy of position measurement while decreasing cost of installation and maintenance, solutions that are installed on-board are proposed. Using the methods of digital signal processing, the measurement data of different sensor types are fused and processed to obtain information about the train's position. Standard on-board equipment such as tachometers are possible components of the system as well as supplementary equipment such as GNSS or IMU sensors.
Main focus in the development lies on reliability of the solution even in challenging environments and estimation of accuracy of the results. The latter is affected by both the measurement quality itself and quality of the provided railway map.
The project is part of Shift2Rail, which is a European rail initiative with focus on research and innovation in railway on European level.

The talk consists of presentation of some current research results on train positioning using GNSS and discuss some problems to solve within the area.



1: Source: Gate2Rail

Gain scaling for active wheelset steering on innovative two-axle vehicle

Rocco Libero Giossi, Rickard Persson, Sebastian Stichel

KTH, Dep. of Aeronautical and Vehicle Engineering, Stockholm, Sweden

Abstract

Within the Shift2Rail project Run2Rail, an innovative single axle running gear with only one suspension step is proposed. A composite material frame shall be used both as structural and as suspension element. To improve curving performance active wheelset steering control is introduced. The selected control aims to minimize the longitudinal creepage by controlling the lateral wheelset position on the track. In this way, the longitudinal creep forces will be balanced between left and right wheel and the wheel wear can be drastically reduced. A two-axle vehicle is created in the MBS program SIMPACK and co-simulation is established with Simulink. The control strategy used is a simple PID control. A set of run cases with different curves and speeds is selected to verify the performance. The control gain optimal for high non-compensated lateral acceleration (NLA) tends to produce unstable results for low speeds (Figure 1 Right blue curves). Control gain scaling is introduced based on vehicle speed and online estimation of the curvature (Figure 1 Left). The proposed gain scaling approach maintains the simple control formulation still solving the instability problem (Figure 1 Right red curves). Gain scaling allows use of optimal control gains for all combinations of curve radii and vehicle speed and thereby taking the full advantage that the active wheelset steering brings to a vehicle with single axle running gears.

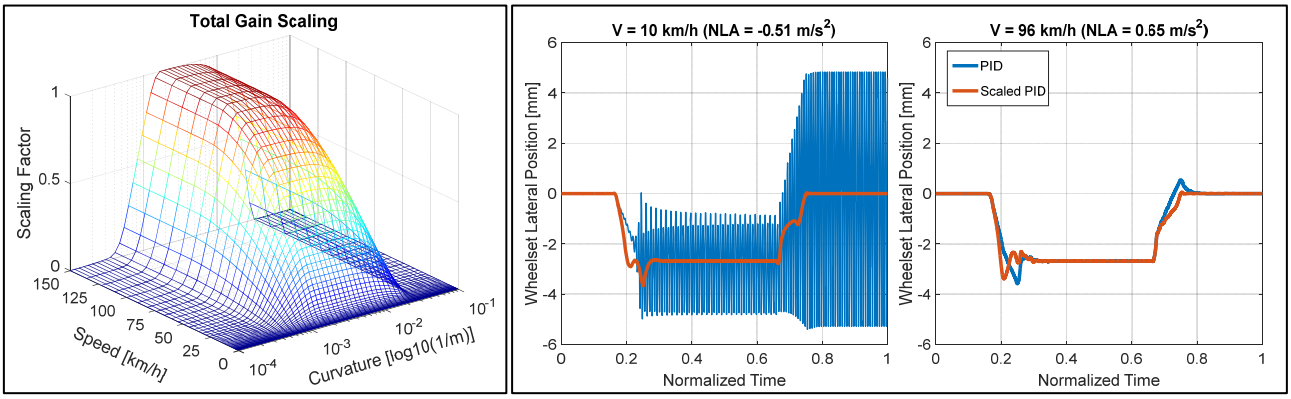


Figure 1 - Gain Scaling function (Left), application of Gain Scaling on wheelset control (Right)

Handbook of Railway Vehicle Dynamics (2nd ed.)

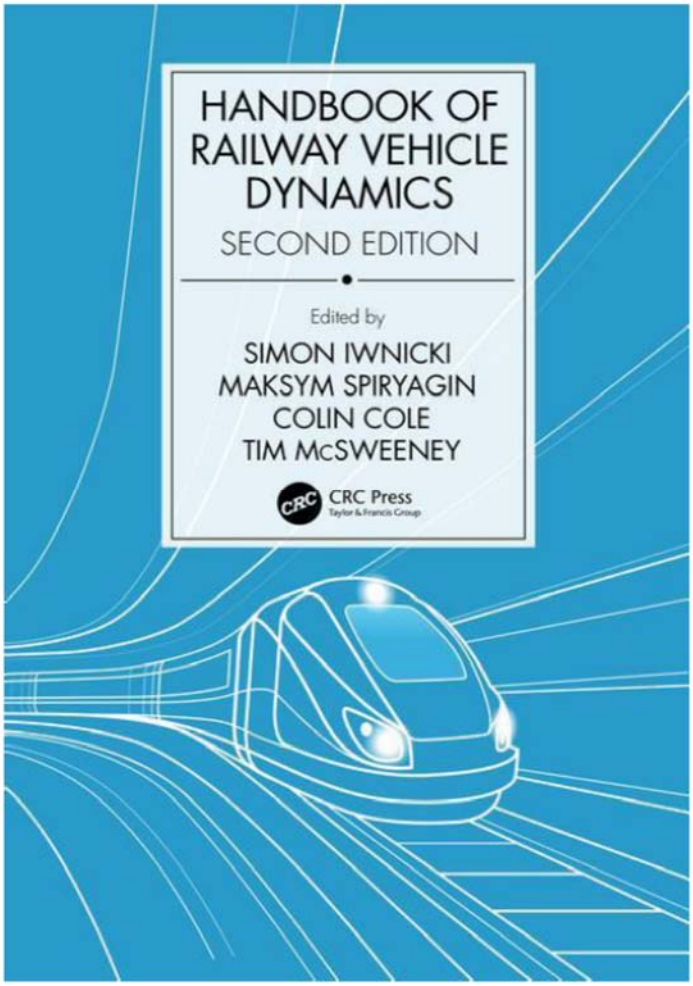
Simon Iwnicki, Maksym Spiryagin, Colin Cole and Tim McSweeney (editors)

Handbook of Railway Vehicle Dynamics, Second Edition, provides expanded, fully updated coverage of railway vehicle dynamics. With chapters by international experts, this work surveys the main areas of rolling stock and locomotive dynamics. Through mathematical analysis and numerous practical examples, it builds a deep understanding of the wheel-rail interface, suspension and suspension component design, simulation and testing of electrical and mechanical systems, and interaction with the surrounding infrastructure, and noise and vibration. Topics added in the Second Edition include magnetic levitation, rail vehicle aerodynamics, and advances in traction and braking for full trains and individual vehicles.

CRC Press
December 2, 2019
Reference – 893 pages – 842 B/W Illustrations
ISBN 9781138602854 – CAT# K388211

For more information, see the link:

https://www.crcpress.com/Handbook-of-Railway-Vehicle-Dynamics-Second-Edition/Iwnicki-Spiryagin-Cole-McSweeney/p/book/9781138602854#googlePreviewContainer



Traffic induced vibrations in buildings on piled foundations

Freddie Theland, PhD Student
KTH, Division of Structural Engineering and Bridges

Abstract

The densification of urban environment drives the desire to build on previously unused land close to railway lines or heavily trafficked roads leading in to cities. In the Stockholm area, and at many other places in Sweden, the railway network is partially constructed in areas with relatively shallow glacial clay deposits overlaying a high quality bedrock. Ground improvement on such sites is commonly achieved by using end-bearing pre-fabricated concrete piles.

Utilizing land close to traffic lines for apartment or office buildings, the risk for comfort disturbing vibrations induced by traffic becomes imminent. Therefore, assessment of expected vibration levels are required. However, modelling predictions of expected vibration levels are subject to many uncertainties. The most important one being the interaction between the soil and the structure and its foundation, as it cannot be validated by measurements at the prospective site before construction.

In this project, a method for the prediction of vibration levels in planned buildings close to existing railway lines is developed. Site specific conditions such as the train loading and the propagation path are taken into account by performing measurements at site, while numerical modelling techniques are used to include the planned building and estimate vibration levels.

To investigate the transmission of vibrations to piled foundations in typical Swedish soil conditions, a field experiment is designed, dedicated to perform measurements in the staged construction of a simple pile group to evaluate the strategy and the interaction between the piles and the soil.