**Semianalytical Comparison of Layered Models of Railway Track**

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**Abstract:**

In this presentation, a new form of semianalytical results related to inertial objects that are traversing longitudinally homogeneous infinite structures, introduced in previous author’s works, is used to analyze layered models of railway track composed of a guiding structure in form of a beam and a supporting structure composed of discrete masses, springs, and dampers. Focus is placed on the connection between the critical velocities, the onset of instability and on the dynamic interaction between proximate moving inertial objects.

The new semianalytical results are obtained for infinite structures, but in addition to these derivations, equivalent finite models are presented and solved in order to provide easy validation. For such structures, the eigenmode expansion method is used and therefore the natural frequencies and orthogonality conditions are derived. Furthermore, due to the coupling of modal equations, a rearrangement of the terms involved is introduced to save computational time. Connection to the critical velocity between both approaches is also derived.

All results, both from finite models and from infinite models, are presented as much as possible analytically using dimensionless parameters, and therefore can be used directly for several combinations of input data.

One of the most important conclusions is that for two moving proximate masses, the external viscous damping coupled with the dynamic interaction can shift the onset of instability deeply into the subcritical range of velocities. Such conclusion is important for railway track design. Particularly, since the general guidelines are directed to avoiding the critical velocity, it is important to know under what circumstances the onset of instability of two proximate moving inertial objects can occur in the subcritical velocity range. In addition, it is also important to know how the dynamic interaction between the guiding structure and foundation affects the lowest critical velocity.

**Biography of presenting author**

Zuzana Dimitrovová holds a degree in Civil Engineering (1983) and Mathematical Analysis (1990) and Ph.D. in Mechanical Engineering (1997). She authored more than a hundred scientific publications in international journals, books and conference proceedings; along with reports and other publications, this completes nearly two hundred works. She has edited five conference proceedings and twelve special issues in international journals. She is an associate editor of the Journal of Vibration Engineering and Technologies and a member of the editorial board of four other international journals. She chaired 11th ICOVP-2013, VETOMAC XIV-2018 and 10th WMVC 2022. She has participated several times in the evaluation of European projects. She has taught at four different institutions. She proposed and coordinates a postgraduate course in Railway Rehabilitation.

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