SUMMARY

Assessing railway track support conditions is an important activity for railway managers around the world. In this context, an alternative and novel methodology to evaluate railway track support conditions is now under development. This methodology is based on modal analysis of the multi-element system composed by a railway infrastructure and an instrumented railway vehicle moving over it. It belongs to the group of vibration-based structural damage identification methods and is focused on observing the characteristic frequencies of this multi-element system, which can be related with changes in the physical properties of the railway infrastructure under analysis. An important feature of the proposed methodology is that it should enable the collection of information regarding the conditions of a railway infrastructure's subgrade, an element that is often overlooked during monitoring operations. By performing this assessment of a railway infrastructure over its length, and over time by comparing different rides over the same railway stretch, important information can be gathered regarding the support conditions of the track.

An important aspect of this methodology that must be validated is the suitability of the underlying theoretical model to adequately describe reality and its usefulness in interpreting the data acquired with an instrumented vehicle. More specifically, the topic of characterizing track support conditions of a railway infrastructure through its natural frequencies is something that must still be validated. Numerical simulations tests using the multibody simulation software Simpack are currently being performed to assess this topic. This paper describes the preliminary simulations performed in this context, including a description of the Simpack model used. The obtained results support the selection of the proposed theoretical model and represent an important step in the validation of the methodology.

Keywords

Track monitoring, Track support conditions, Modal analysis, Vibration-based structural damage identification methods, Vehicle-based inspection, Signal processing