Dynamic responses of train-track system to single rail irregularity

Zakeri, J.A., Xia, H., Fan, J.J.

A dynamic analysis method has been developed by which the vertical response of railway tracks subjected to a moving train can be investigated. The train and track are modeled as dynamic systems and the compound train-track system is treated as a whole. In the track model, the rail is treated as a Raleigh-Timoshenko beam and discretely supported, via rail pads, to flexible sleepers. The rail beam is modeled by using finite elements and two semi-infinite boundary elements at both ends. The wheel/rail contact is modeled by non-linear Hertzian spring elements. Based on this model, DATI computer software is designed to simulate the vertical dynamic interactions between railway tracks and vehicles. The model permits calculation of deflections, accelerations and forces in various track components, and also can study how parameters such as train speed, axle load, rail corrugations, wheel flats and so on influence the track and vehicle components.