Friedrich-Alexander-Universität
Erlangen-Nürnberg

Lehrstuhl für
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Einladung

Im Rahmen des Seminars zu Fragen der Technischen Mechanik findet am Freitag, dem 11.04.2008, um 14:00 Uhr im Seminarraum des KTmfk, Martensstraße 9, folgender Vortrag statt:

Herr M.Sc. Shashank Gupta
Department of Civil Engineering
Structural Mechanics Division
K.U. Leuven, Belgium

"A numerical model for ground-borne vibration from underground railways"

Abstract: An efficient and modular numerical prediction model is presented to predict vibrations and re-radiated noise in buildings due to metro trains. The problem can be classified into three weakly coupled problems: the dynamic vehicle-track-tunnel-soil interaction problem, the dynamic soil-structure interaction problem and the calculations of the acoustic response inside the rooms.

The three-dimensional dynamic tunnel-soil interaction problem is solved with a subdomain formulation, using a finite element formulation for the tunnel and a boundary element method for the soil. The periodicity of the tunnel and the soil in the longitudinal direction is exploited using the Floquet transform.
The track-tunnel-soil interaction problem is solved in the frequency-wavenumber domain and the wave field radiated into the soil is computed. This incident wave field is used to solve the dynamic soil-structure interaction problem on the receiver side by means of a coupled finite element-boundary element formulation and to determine the vibration levels along the structural elements. A weak coupling between the structural and acoustic vibrations is accounted for and an acoustic 3D spectral finite element method is used to predict the acoustic response.

To demonstrate the efficiency of the approach, an invariant concrete tunnel embedded in a layered half space is modelled using the coupled periodic finite element-boundary element approach. The response in the free field due to a moving vehicle is predicted in the frequency range 1-150 Hz, and subsequently the re-radiated noise in a multi-story portal frame office building is estimated. The proposed methodology is used to investigate the efficiency of various vibration countermeasures such as a floating slab track in the tunnel, base-isolation of the building and a box-within-box arrangement in the room. It is shown that the track isolation is a very effective measure to mitigate the vibrations and re-radiated noise in buildings close to metro lines.

Erlangen, 03.04.2008
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