

Master Thesis

Modelling of a layered half space with cylindrical excavation using the Integral-Transformation-Method (ITM)

Motivation:

The numerical investigation of railway induced environmental vibrations has received considerable attention in the past years. The passage of vehicles over uneven tracks generates elastodynamic waves that propagate through the soil leading to vibrations at the soil surface and also to structural vibrations in nearby buildings

The wave propagation in an infinite elastic half space can be solved analytically using the Integral-Transformation-Method (ITM). Fundamental solution for systems like a halfspace or a fullspace with cylindrical cavity were derived in literature. By superposing those fundamental systems also solutions for more complex geometries can be obtained.

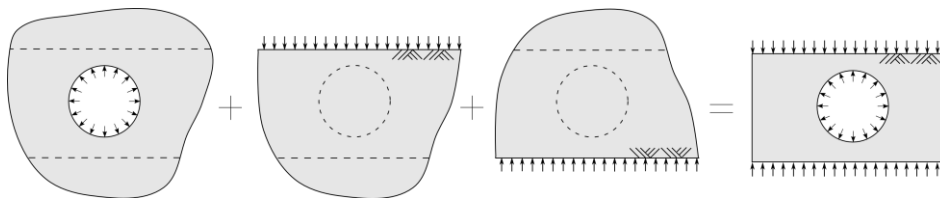


Figure 1: Superposition of a fullspace with cylindrical cavity and two half spaces to a layer with cylindrical cavity.

Tasks:

In the scope of this thesis the already existing solutions for a fullspace with cylindrical cavity and a half space (implemented in a Matlab code of the chair) shall be superposed in order to model a single layer with a cylindrical excavation. This system shall then be coupled to the fundamental system of a half space using the substructure technique.

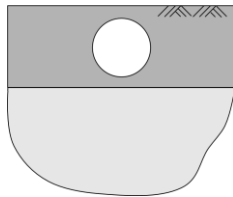


Figure 2: Layered half space with cylindrical cavity in one layer.

Finally the vibrations at the surface due to dynamic excitation within the tunnel placed in the layer (e.g. by a passing subway) shall be evaluated.

The thesis can be written in either English or German.

Supervisor:

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Literature:

Hackenberg, M.: A Coupled Integral Transform Method - Finite Element Method Approach to Model the Soil-Structure-Interaction, Technische Universität München Dissertation. München 2016

Frühe, G.: Überlagerung von Grundlösungen in der Elastodynamik zur Behandlung der dynamischen Tunnel-Boden-Bauwerk-Interaktion, Technische Universität München Dissertation. München 2010



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