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# Dynamic Interaction between Two Neighboring Tunnels in a Layered Half-Space

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**Abstract :** The vast majority of existing underground railway lines consist of twin tunnels. In this paper, the dynamic interaction between two neighboring tunnels in a layered half-space is investigated by an analytical model. The two tunnels are modelled as cylindrical thin shells, while the soil in the form of a layered half-space with two cylindrical cavities is simulated by the elastic continuum theory. The transfer matrix method is first used to derive the relationship between the plane wave vectors in arbitrary layers and the source layer. Thereafter, the wave translation and transformation are introduced to determine the plane and cylindrical wave vectors in the source layer. The solution for the dynamic interaction between twin tunnels in a layered half-space is obtained by means of the compatibility of displacements and equilibrium of stresses on the two tunnel–soil interfaces. By coupling the proposed model with a fully track model, the train-induced vibrations from twin tunnels in a multi-layered half-space are investigated. The numerical results demonstrate that the existence of a neighboring tunnel has a significant effect on ground vibrations.

**Keywords :** underground railway, twin tunnels, wave translation and transformation, transfer matrix method
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