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Ph.D.ICEAA
Ph.D. Program in Civil, Building Construction and Environmental Engineering

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Numerical Study on the Pantograph-Catenary Dynamics for the Application of Heavy-Duty Trucks

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Abstract

The pantograph-catenary powered heavy truck system has been built in many countries to reduce carbon emissions and increase transportation efficiency of the heavy truck. However, the dynamics of the pantograph-catenary interaction system under the influence of truck-road interaction has not been widely investigated so far. In this work, the dynamic behavior of the pantograph-catenary powered heavy truck system is studied. A pantograph-catenary-truck-road interaction model is formulated based on the existing test line, where the reduced catenary model and reduced-plate model transmission method are used to minimize the demand on calculation effort. Then, the influence of different road qualities on pantograph-catenary interaction dynamics is studied. The results show that the truck-road interaction has a heavy influence on pantograph-catenary interaction dynamics in 1-5 Hz frequency domain and the corresponding vibration should be considered and isolated to optimize the dynamic behavior of the pantograph-catenary system

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