Computational Modeling of Vehicle-Irregularity-Bridge Dynamic Interaction by Damage Mechanics

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ABSTRACT

This work deals with the dynamic interaction vehicle-irregularity-bridge through the Finite Element Method, considering the stiffness loss of the bridge by damage mechanics. The irregularities of the track dynamically excite the vehicle, which in turn provokes additional vibrations in the structure of the bridge, besides those produced by their own movement. This condition tends to increase the responses in terms of displacement and stress especially in the resonance conditions. The approach developed in this work treats this phenomenon uncoupled. The track irregularities are represented by sinusoidal harmonic functions. In the bridge model are used finite elements of Euler-Bernoulli, with Hermite cubic interpolation functions. The structural damping is defined by the Rayleigh method. The equations of motion are obtained by dynamic equilibrium and numerically integrated in time using the Newmark method. The dynamic response of the bridge is affected by the deterioration degree. In this sense, this work aims to evaluate the dynamic effects produced in a structural model on which the degree of damage is altered over time. This proposal aims to contribute to the study of the health monitoring of bridges structures.

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