

Reconstruction of road defects and road roughness classification using vehicle responses with artificial neural networks simulation

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Abstract

The road damage assessment methodology in this paper utilizes an artificial neural network that reconstructs road surface profiles from measured vehicle accelerations. The paper numerically demonstrates the capabilities of such a methodology in the presence of noise, changing vehicle mass, changing vehicle speeds and road defects. In order to avoid crowding out understanding of the methodology, a simple linear pitch-plane model is employed. Initially, road profiles from known roughness classes were applied to a physical model to calculate vehicle responses. The calculated responses and road profiles were used to train an artificial neural network. In this way, the network renders corresponding road profiles on the availability of fresh data on model responses. The results show that the road profiles and associated defects can be reconstructed to within a 20% error at a minimum correlation value of 94%.