Multivariate Pavement Acoustic Performance Model

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Abstract

Road traffic noise pollution is a major environmental problem predominated by the generation of tyre/road noise. The interaction between the tyre and the road is a complex contact mechanics problem involving multiple scales and many physical phenomena such as rolling resistance, skid resistance, wear and noise. Great part of noise emission is caused by radial tyre vibrations, therefore modelling this influence on the noise generation phenomena is a matter of major importance.

The main objective of this thesis is to improve existing models on tyre/road noise estimation, integrating them in a multivariate approach with new information concerning the characteristics of the pavement, the morphology of the components and their mechanical characteristics. In order to do so the approach considers 3D envelopments of the road texture based on contact mechanics of road asperities. A new methodology to obtain this 3D envelopments based on machine learning algorithms applied to digital image processing and laser measurements is proposed.