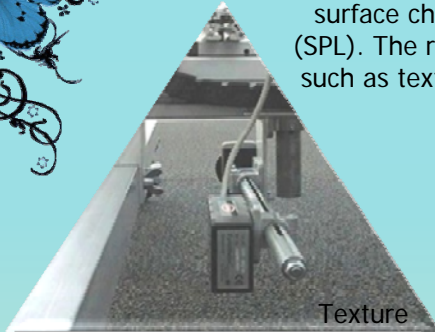




# Tyre/Road Noise Change

RESEARCH SCHOOL INTEGRAL DESIGN OF STRUCTURES

## New Approach for Modeling



Texture

### Subject

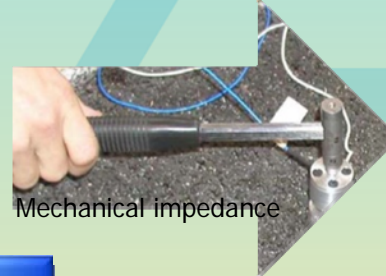
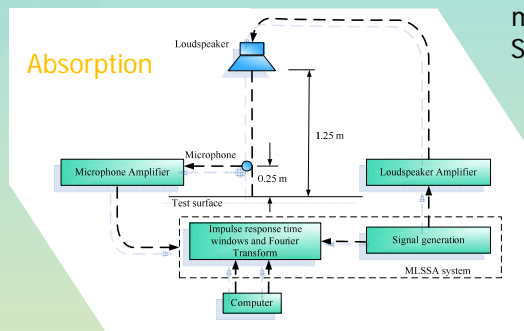
Most existing models on tyre/road noise describe the total path from road surface characteristics to noise and estimate the total Sound Pressure Level (SPL). The road parameters in these models are normally derived parameters such as texture spectrum but not construction materials which are important for road contractors.

### Goal

A new model is proposed to be used for investigating the effects of road construction material changes on tyre/road noise emission and can be combined in the existing models to improve prediction accuracy.

### Expected Results

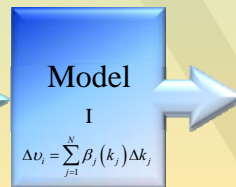
The model is established solely based on surface mixture properties and road surface characteristics. Sensitivity of the noise to individual road parameter change can be investigated.



Mechanical impedance

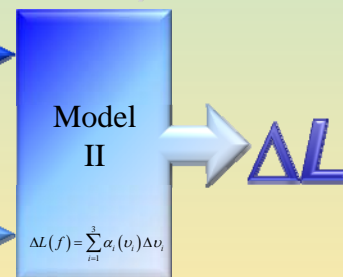
$v_i$ :  
Texture  
Acoustical characteristics  
Mechanical impedance

Surface layer properties  $k_j$  and  $\Delta k_j$



Road surface characteristics  $v_i$  and  $\Delta v_i$

Road surface characteristics  $v_i$  and  $\Delta v_i$



$k_j$ :  
Gradation  
Max aggregate size  
Binder content  
Air voids  
...



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## Tyre/Road Noise Change New Approach for Modeling

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### Subject

Most existing models on tyre/road noise describe the total path from road surface characteristics to noise and estimate the total Sound Pressure Level (SPL). The road parameters in these models are normally derived parameters such as texture spectrum but not construction materials which are important for road contractors. However, in some traffic noise prediction models, changes due to mixtures e.g. maximum aggregate size have been combined as correction and made the prediction more accurate. It is essential to develop a detailed study on tyre/road noise level changes caused by small variance of material properties and establish a model to describe this relationship.

### Goals

The target model is proposed to be used for investigating the effects of road construction material changes on tyre/road noise emission. It can also be combined in the existing models to improve prediction accuracy.

### Research Question

How does different road parameters influencing the change of tyre/road noise emission? What approach should be appropriate for variable selection and regression?

### Strategy

The work is to be completed in two ways: On one aspect, measurement is carried out for testing the acoustical characteristics and the corresponding noise generation of certain mixtures such as thin surface, porous asphalt, etc.; on the other, variable selection, hypothesis testing and the modelling work are performed by analyzing the measurement results and data collected with mathematical approach. Validation of the model is to be done in the end.

### Expected Results

A statistical model is established solely based on surface mixture properties and road surface characteristics. Effect of the tyre and environmental factors are not taken into account. Sensitivity of the noise to individual road parameters can be investigated. Specific models are set up for certain type of surfaces.

### Preferred Partners Applications / Sponsors

Road contractors/Institutes of Transportation and Environment/ Consultancies

### Prime Publication / Prototyping

Mingliang Li, Wim van Keulen, André Molenaar, Martin van de Ven and Rien Huurman, "New Approach for Modelling Tyre/Road Noise," Proceedings of INTER-NOISE Conference (Ottawa, Canada, 2009).

### Research Period

2008 - 2012