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Title:

Practical approach for TPA Model Validation

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Abstract:

Transfer Path Analysis is widely used in vehicle NVH development to identify dominant structure-borne and airborne contributions and to predict receiver noise from vehicle, component, or test-bench measurements. However, a close match between measured reference and synthesized receiver signal does not prove that the underlying TPA model is physically complete or validated. Different interface descriptions, matrix setups, and regularization strategies may lead to similar synthesis levels but different path contributions. This is critical because insufficiently validated models can lead to wrong path contributions, misleading system interpretation, and incorrect countermeasures. Therefore, the focus of TPA validation must not be limited to the synthesis result, but must address the correctness, completeness, and intended use of the model.

This paper provides an overview of practical methods for assessing a TPA model both during model creation and after the initial synthesis. Application examples highlight typical validation conflicts, such as good receiver synthesis despite uncertain model plausibility, matrix condition number and effects of regularization, and misleading path contributions. The paper therefore promotes a combined evaluation of synthesis agreement, interface completeness, source-transfer-receiver plausibility, and robustness under independent validation conditions.

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