Place:

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Title:

Hybrid NVH modeling approach: How numerical and experimental methods complement each other

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Abstract:

The ever-increasing demand for shorter development times and cost savings means that important design decisions must be made at an early stage of the development process. This goal of saving time and reducing costs leads to an increased use of virtual prototypes.

However, by combining the methods of simulation and testing, the idea of saving time and reducing costs can be pushed even further. In addition, in some cases the accuracy of the results can be increased compared to the approach based solely on numerical models or experimental results. Depending on the task and the availability of data (to build virtual prototypes), methods (to model certain physical phenomena) and physical prototypes, the optimal approach must be chosen. In a connected world, where development processes are distributed across different companies, the availability of data and physical prototypes becomes even more critical: companies need to share product features to create system models, but may not want to share development knowledge or product design details.

In the proposed talk, a combined method of measurement and numerical simulation to predict and analyze the NVH properties of an e-bike is demonstrated. In this specific case, the electric drive unit of an e-bike that is already in series production is installed virtually in a numerical model of a new e-bike prototype. The excitation and structural dynamics of the electric drive unit are derived from experiment using the method of blocked forces. This kind of source description is known from the experimental transfer path analysis. In parallel, the numerical model of the e-bike prototype is built using a bottom-up method. The vibrations of the carbon frame induced by the virtually mounted electric drive unit are analyzed. The validity of the approach is shown using experimental data. The model presented can be used for further investigation of the airborne noise excited by the electric drive unit and radiated by the frame, which will be shown in following publications.

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