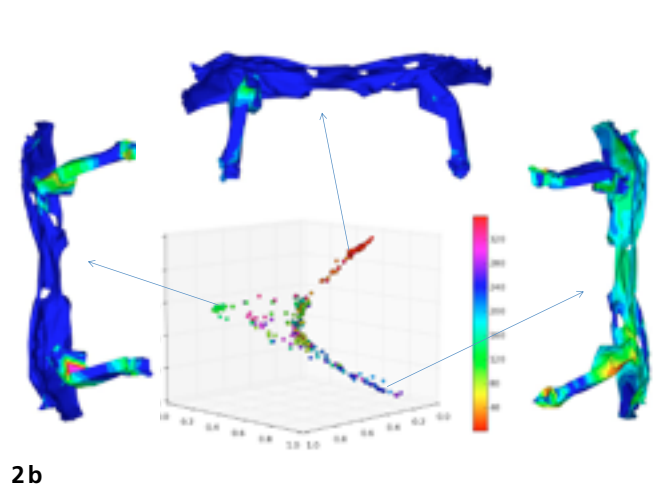


2a



2b

An industrial example in frontal crash

The industrial applicability of the methodology is demonstrated by an analysis test of the location of a bumper for a Toyota car in a frontal crash, performed together with GNS mbH. The bumper location is varied along a circle with radius 20 mm (Figure 2a). A total of 243 LSDYNA simulations have been done, covering uniformly an angle of 360 degrees. Using the newly developed nonlinear dimensionality reduction approach three principal deformation modes with corresponding causal range of angles could be clearly identified in short time (Figure 2b).

An industrial example for vibration analysis

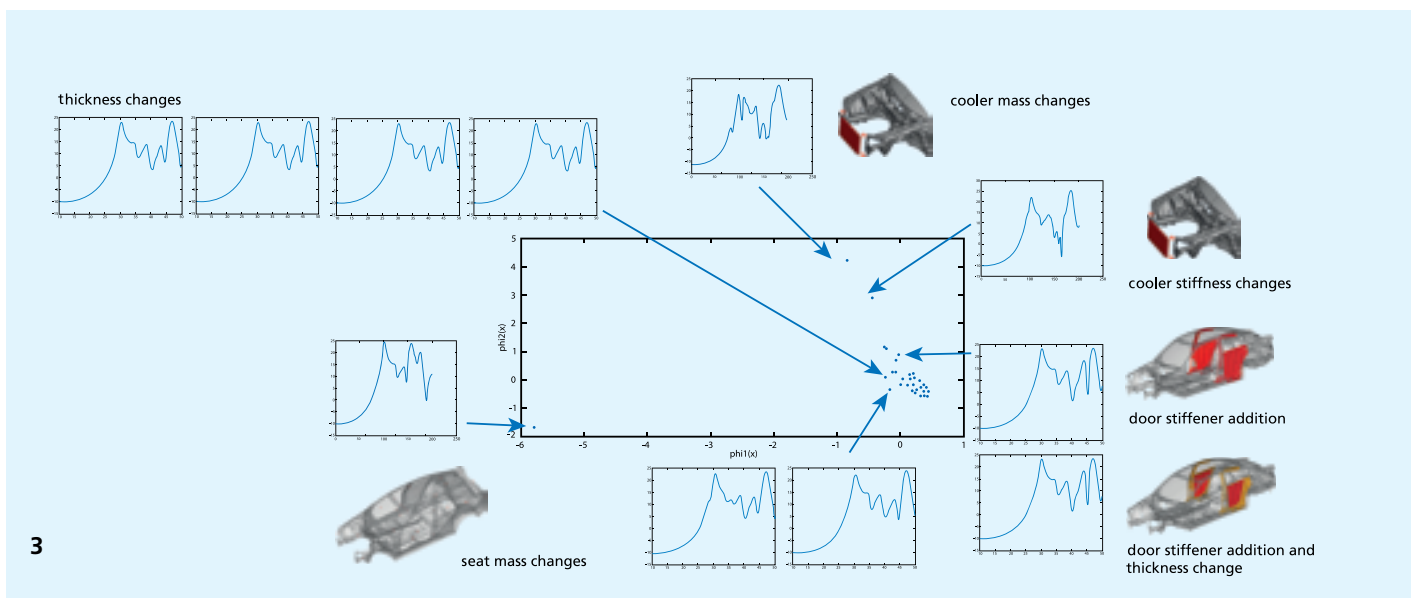
Another use case is the reduction of undesired vibration noise in a car structure. Figure 3 shows the application of the method to NVH-simulations (Noise Vibration Harshness). Car companies develop such simulations in order to analyze the vibration modes of the car structure. From such simulations so-called transfer functions at different points in the structure (like at the console) are extracted. Model variants are generated by changing the geometry of specific components or the material parameters like component thicknesses or mass. FEMMiner (the developed software prototype) processes the transfer curves without any knowledge of the actual changes. Figure 3 shows that the implemented method is able to organize the different curves along the parameters that were changed.

SCAI introduces a unique way to analyze engineering data. It provides an automatic overview of all model changes and allows the extraction and visualization of individual model variants, reducing dramatically the post-processing time in the virtual product development. The software prototype is currently being extended into an industrial software product in particular as a plug-in for existing post processing software. Together with services based on the new analysis tool, software licenses will be provided to the industry.

2a Robustness analysis of a frontal crash (bumper positioning)

2b Deformation modes clustered according to the effect of the bumper positioning. The deformed parts are the frontal supporting beams at a specific time step and they are colored according to the difference to a reference simulation. Each point in the 3D plot represents a deformation and is colored according to the positioning angle of the bumper.

3 Analysis of transfer curves for NVH simulations, the vibration transfer curves get organized according to the realized model's input variations (geometrical and material based).



3