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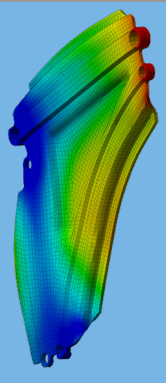
1



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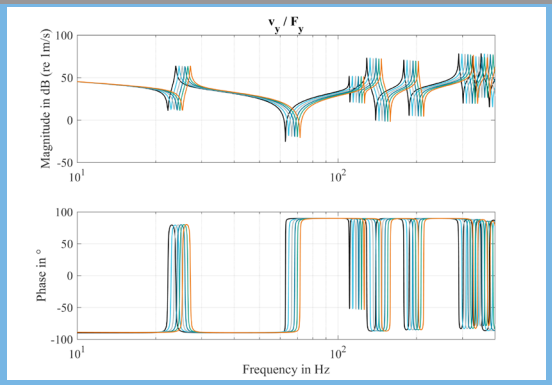

3

1 *Prototypical wishbone made of fiber reinforced composite*
2 *Finite element model of a prototypical wishbone in lightweight design*
3 *Frequency Response Functions of one parametric model with adjustable Young's modulus*

Fraunhofer Institute for Structural Durability and System Reliability LBF

Bartningstraße 47
64289 Darmstadt

Contact:

Christoph Tamm
Telefon +49 6151 705-8431
christoph.tamm@lbf.fraunhofer.de

www.lbf.fraunhofer.de

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EFFICIENT AND PARAMETRIC DIGITAL TWINS

Motivation

Digital twins are numerical models approximating the physical world that process real and virtual information simultaneously. The combination of calculated and measured signals enables a more detailed and extended analysis of technical systems. Parametric and real-time digital twins also provide other interesting application scenarios. The models can be validated fast and efficiently or can be used for condition monitoring or as virtual sensors.

Results

At the Fraunhofer LBF, research on the modeling of parametric and real-time capable digital twins is performed. Mechanical structures are described in detail using finite element models. Efficient models that can be solved in real time are derived by means of parametric model order reduction methods. In the context of digital transformation, a variety of application scenarios arise for these types of models. For example in design and optimization procedures, the analyses of components and systems can be performed more efficiently. In particular, the focus is on feasibility and sensitivity analyses, design space exploration, and parameter studies in Hardware-in-the-Loop tests (variation of the virtual rest of the system). The numerical models generated in the development phases can also be used for condition monitoring during operation. The values calculated in the numerical model can be used as virtual sensors and for automated online model update.

Services offered

The Department of Structure Dynamics and Vibration Technology offers structure dynamic analyses, vibration optimization technology as well as the development and application of modern methods for numerical system simulation.