NAFEMS UK Regional Conference 2018 - Abstract Submission

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Name	Dr. Nils Wagner
Job Title	Senior Researcher
Company	INTES GmbH
Department	Pre-Sales
Please identify the event for which your submitting?	NAFEMS UK Conference 2018
Will you be the presenting author?	Yes
Presenting Author	Mr.
Presentation Title	On the way to a digital prototype - Wish or already reality?
Relevant Themes / Keywords	Model Updating, MAC matrix, Experimental Modal Analysis

Abstract (plain text)	Finite element analysis is an indispensable tool to support the virtual product development. In practice, the validation of finite element models is often still based on costly and time-consuming experimental modal analyses. A downstream integrated model update by adapting geometry and material parameters allows the adaptation of the simulation model based on the available (incomplete) measured quantities, such as mass, natural frequencies and frequency responses to the measurement model. In contrast to individual components, which may have anisotropic material properties, the experimental modal analysis of assemblies also makes it more difficult to consider the coupling of components in the finite element model. Thus, a suitable representation of joints is still a non-trivial task for the calculation engineer. The MAC matrix, which is a measure of the correlation between measured and calculated eigenforms, has been established for modal comparison. PERMAS offers a so-called pre-test to select suitable sensor positions, which suggests nodes for the application of the sensors to the engineer based on the simulation model. The measurement model and the corresponding results of an experimental modal analysis are exported as a universal file and can be imported into PERMAS as a wireframe model. The integration of the measuring points into the finite element model is carried out via incompatible MPCs, as the nodes in practice are generally not coincident with the sensor positions. After appropriate optional repositioning and reorientation of the simulation model in relation to the (scaled) measurement model, the MAC matrix is calculated directly in PERMAS. A subsequent optimization for user-defined design variables minimizes the sum of the error squares between measured and calculated eigenfrequencies under a constraint for the mass of the structure. The continuous process chain is presented by means of examples. The data and findings collected in this way can flow into subsequent projects and facilitate the setting up of a digital prototype, so that finally the number of experimental modal analyses can be reduced.
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