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Structural analysis of composite components considering manufacturing effect

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ABSTRACT

An improvement of a structural simulation for composite structures is realized with data sets from process simulations. A main challenge is to provide a meshindependent interface for finite element (FE) data conversion. In this work, the FE data conversion for structural analysis is discussed. All relevant material parameter and model data can be exchanged with a mesh-independent method, between different process simulation tools and tools for a subsequent mechanical analysis. This approach is based on mapping algorithms and a common data format definition. An approximated FE field value is transferred into the target mesh with respect to the corresponding coordinate system and the material structure. In this paper, different models for subsequent material prediction of sheared woven fabric composites are considered and validation results for several analytical meso-modeling strategies of stiffness properties for such fabrics are demonstrated.

approaches [5, 6].

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into each other and structural analysis [3, 4]. The

manufacturing process changes e.g. fiber orientation and

thickness values and effects thereby the fiber volume

content of used materials. Therefore, a prediction of the as-

built material properties of unidirectional (UD), non-crimp

(NCF), woven and braided fabrics for a structural analysis

has to be realized with different analytical and FE-based

For woven fabrics different models for twill, plain or satin

structures have been investigated [7, 8]. The waviness and

1. Introduction

Analysis and design of composite structures are dependent on material modeling, FE analysis strategies and manufacturing constraints. Process simulation and structural analysis are needed for a detailed prediction of the behavior of a composite component. A virtual process chain is a challenge for different fields of engineering using several FE solvers and materials [1, 2]. Particularly, the different process simulations are mostly not integrated

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