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Multidisciplinary Tool for Composite Wind Blade Design & Analysis

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Abstract

Composite part design process proceeds with the designers' gradually eliminating the uncertainty in design parameters. However, the analysis tools that have been developed to aid this process require the designer to decide precise parameter values at the very beginning of the design stage which reduces their effectiveness. To improve their utility, this paper introduces a management strategy to integrate multi-disciplinary analysis modules with CAD software and account for design uncertainties during the design stage. Interdependent cross-disciplinary design parameters are separated in accordance with their uncertainty levels, and different fidelity analysis models are assigned to each set of parameters accordingly. As the design process proceeds, more precise design parameters are input for analysis modules that have higher level of fidelity. This management method resembles the practical design flow and is therefore intuitive to the designer in the decision-making process. An example using this approach to develop multidisciplinary composite wind blade with such design and analysis software is shown to illustrate its effectiveness and efficiency in complex composite part design.

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