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# Fast Generation of High-Performance Driveshafts: A Digital Approach to Automated Linked Topology and Design Optimization

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**Abstract :** In this article, we investigate an approach that digitally links individual development process steps by using the drive shaft of an aircraft engine as a representative example of a fiber polymer composite. Such high-performance, lightweight composite structures have many adjustable parameters that influence the mechanical properties. Only a combination of optimal parameter values can lead to energy efficient lightweight structures. The development tools required for the Engineering Design Process (EDP) are often isolated solutions, and their compatibility with each other is limited. A digital framework is presented in this study, which allows individual specialised tools to be linked via the generated data in such a way that automated optimization across programs becomes possible. This is demonstrated using the example of linking geometry generation with numerical structural analysis. The proposed digital framework for automated design optimization demonstrates the feasibility of developing a complete digital approach to design optimization. The methodology shows promising potential for achieving optimal solutions in terms of mass, material utilization, eigenfrequency, and deformation under lateral load with less development effort. The development of such a framework is an important step towards promoting a more efficient design approach that can lead to stable and balanced results.

**Keywords :** digital linked process, composite, CFRP, multi-objective, EDP, NSGA-2, NSGA-3, TPE
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