Dedicated Parametric Modeling Techniques for Simulation-Driven Design using STAR-CCM+

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CAE-suites allow the automatic generation of geometry variants and the development of sophisticated strategies to help find an optimal design. The geometry representation of complex free-form surfaces is one important aspect when it comes to automated CFD-based optimizations of flow-exposed products.

Typical examples for functional free-form surfaces are compressors and turbine blades, wings, ship hulls, nozzles, ducts, diffusers and many more. On the one hand, engineers want to investigate only feasible shapes of their automatically varied geometries that fulfill a set of constraints. Simultaneously, the number of free variables needs to be reduced as much as possible to save expensive CFD evaluations. Feasibility of geometry and complexity reduction can be established with dedicated modeling techniques which directly address CFD-related functional surfaces.

In this presentation, examples are given to illustrate special parametric modeling solutions in the context of simulation-driven design. Geometry models from selected industries are briefly discussed. It is shown how such models are created, modified and managed in the integration platform FRIENDSHIP-Framework. The automated design process is outlined where STAR-CCM+ is utilized and controlled in batch mode for the analysis of generated product variants. Optimization examples using STAR-CCM+ will be shown.

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