OPTIMIZING FATIGUE LIFE USING AUTOMATED SEQUENTIAL COUPLING IN THE LOOP

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ABSTRACT

Optimization in the CAE domain has been around for over two decades and continues to become main stream. Types of optimization range from capabilities built into individual solvers to the utilization of wrapper optimization software. This wrapper software contains a variety of optimization algorithms and manages the simulation by modifying design variables based on simulation results (responses) while continuously iterating until an optimized set of parameters are identified. Traditionally this kind of software is applied to solvers running in an uncoupled fashion whereas this presentation will demonstrate how wrapper optimization software can be applied to a fully automated sequentially coupled simulation.

Altair HyperStudy was applied to an automated sequential coupling example to demonstrate how optimization can be done with coupled solvers. In this study, design variables were setup that represented morphing parameters for a structure. An automated process utilized those design variables through a process for creating and running OptiStruct to generate a flexbody, integrating it into an MBD model, running the MotionSolve simulation to obtain stress modal participation factors, and running DesignLife to calculate fatigue responses. These responses were then read by HyperStudy to complete the optimization loop. In addition, the original FE model for the structure leveraged Altair's manufacturing software to obtain an input deck with varying thicknesses due to its potential effect on fatigue life.

The setup and process for this multiphysics example using optimization with a fully automated sequentially coupled solution will be presented. Results of the study and aspects of how this process can be applied more generally will be presented as well.