Optimization of the Airbus A380 Vertical Tail Plane

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The design of large aircraft substructures considering local failure criteria such as buckling and local strain is a task that typically involves the optimization of a large number of components combined with the optimization of the structure as an assembly, similar to a multi-level optimization approach. The objective of the study the progress of which is presented is the development of a design tool that performs a weight minimization of a large aircraft substructure (the Vertical Tail Plane (VTP) of the A380) while considering a topological variety as well as the scaling parameters.

The first step of such a procedure involves the solution of a coarse global finite element (FE) model (of the entire substructure) under a global load case, the output of which is a local load set for all components. The optimization of all components is done using a Genetic Algorithm (GA) coupled to a Neural Network (NN) based response surface. The substructure is then reassembled based on the modified (optimized) components and new local loads are computed using the aforementioned global model. This process is repeated until convergence is achieved (local loads or optimal designs do not change anymore).

Results include the optimization of simple box under a twisting load case. Tests on the full VTP structure will commence shortly after submitting this abstract. The presentation will explain the basics of the developed optimization program and show results.