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Simplify Optimization using Hierarchical Free Form Deformations and Metamodels

Hydrodynamic performance optimization of ship hulls is becoming popular in modern naval architecture, but for the cost, time and knowledge required, only research centers and big shipyards can afford it.

In order to help Companies in CFD Simulations, predefined templates created by software experts are becoming more and more available in CFD Solvers.

In parallel, in order to simplify the use of optimization algorithms, an increasing number of optimizers use metamodels, so to reduce the number of CFD calculations required.

Furthermore, parameter reduction techniques can reduce the number of total simulations needed. The idea is to reduce the simulations requested through the reduction of the global investigation domain, using less parameters, reducing their domain and using different deformations.

In particular, Hierarchical Free Form Deformation can be used to perform multilevel deformations, from global to very local ones.

This paper describes the validation of a framework created using a commercial solver template, the kriging surface created by DAKOTA and the Hierarchical Free Form Deformation as reduction parameter technique for the resistance optimization of the Duisburg Test Case Containership in rough water, helping Companies to be more aware and confident in the use of these techniques.

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