

Industrial application of an adjoint level-set based optimization method

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There has recently been a distinct increase in the use and development of adjoint methods for optimization in industry and academia. However, there remains many challenges to overcome in order to make adjoint methods efficient and robust for industrial applications and to ensure that the final (optimized) geometry is manufacturable. The fact that the calculation of the sensitivity derivatives is equivalent to the cost of the solution of the primal problem, gives adjoint methods a huge advantage compared to stochastic optimization methods. Here, we present the development and application of the continuous adjoint of the incompressible Navier-Stokes coupled with the level-set method applied to topology optimization.

In the first stage, the augmented objective function is derived. After the solution of the primal and the adjoint equations, the surface sensitivity derivatives are calculated. The presented method is developed in the in-house optimization tool based on OPENFOAM libraries. The presented method is demonstrated in several industrial cases such as a HVAC duct, a gearpump and a climate control distribution system

References

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