Topology Optimization for Coupled Thermos-Fluidic Problems

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ABSTRACT

Topology optimization is a numerical method for determining optimal material distributions. Originally developed for stiffness optimization of elastic structures, the method has since then expanded to all kinds of other physics and multiphysics problems. Application areas rich on challenges are fluid and thermofluidic problems. Apart from the issues associated with efficient numerical solving of coupled fluid problems, various issues with regards to material interpolation models and boundary modelling and control provide additional challenges.

The talk will review recent activities on topology optimization of thermofluidic problems within the TopOpt group. On the parameterization side we discuss pros and cons between element-based (fictitious domain) and boundary tracking topology optimization formulations [1] as well as comparisons between Finite Element and Lattice Boltzman formulations. On the application side we discuss recent applications within systematic design of active and passive [1] (natural convection) cooling devices, heat exchangers, as well as simplified models for fire-protection of structures.

REFERENCES

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[2] Alexandersen, J.; Aage, N.; Andreasen, C. and Sigmund, O., Topology optimisation for natural convection problems, *International Journal for Numerical Methods in Fluids*, 2014, *76*, 699-721.