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# Multi-objective Shape Optimization in Forced Heat-convection Field

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We present a numerical solution to multi-objective shape optimization problems in steady forced heat-convection fields. In our previous study, its have been dealt with a single-objective shape optimization problem for total dissipation energy minimization in the domain of a viscous flow field and a single-objective shape determination problem of temperature distribution prescribed problem in specified sub-domains of heat-convection fields. In this study, a multi-objective shape optimization problem is formulated for the temperature distribution prescribed problem, while the total dissipation energy is constrained to a desired value, in the steady forced heat-convection fields. Shape gradient, which means shape sensitivity for shape modification, for the multi-objective shape optimization problem is derived theoretically using the adjoint variable method and the formulae of the material derivative. Reshaping is performed using the traction method, which has been proposed as an approach to solving shape optimization problems. The validity of proposed method is confirmed by results of 2D numerical analysis.

**Keywords:** Shape Optimization, Inverse Problem, Heat Transfer Design, Adjoint Method, Traction Method