Solution to Shape Identification of Unsteady Natural Convection Fields to Control Temperature Distribution EIJI KATAMINE, Department of Mechanical Engineering, National Institute of Technology, Gifu College, SHINYA IMAI, Department of Mechanical Engineering, Nagaoka university of Technology, MATHMATICAL DESIGN TEAM, COMPUTATIONAL MECHANICS TEAM — This paper presents a numerical solution to shape identification of unsteady natural convection fields to control temperature to a prescribed distribution. The square error integral between the actual temperature distributions and the prescribed temperature distributions on the prescribed sub-boundaries during the specified period of time is used as the objective functional. Shape gradient of the shape identification problem is derived theoretically using the Lagrange multiplier method, adjoint variable method, and the formulae of the material derivative. Reshaping is carried out by the traction method proposed as an approach to solving shape optimization problems. Numerical analyses program for the shape identification is developed based on FreeFem++, and the validity of proposed method is confirmed by results of 2D numerical analyses.

Eiji Katamine
Department of Mechanical Engineering, National Institute of Technology, Gifu College