

عنوان مقاله:

A Flow Topology Optimization Method for a Diffuser Using the Lattice Boltzmann Method

محل انتشار:

هجدهمین کنفرانس دینامیک شاره ها (سال: 1398)

تعداد صفحات اصل مقاله: 11

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خلاصه مقاله:

We consider the optimal design of incompressible fluid flow through a diffuser at low Reynolds numbers. The design problem is solved by a topology optimization approach providing a mechanism to create novel and non-intuitive optimal designs in a mathematical process. While size and shape optimization methods are limited to modifying existing boundaries of an initial design, topology optimization allows to merge and evolve boundaries without requiring an initial guess. Topology optimization of fluid flow is commonly based on a material interpolation approach in geometry representation. Here the solid material is modeled as an artificial porous region to impose zero velocities. Fluid flow is then predicted by the lattice Boltzmann method, which has a simpler numerical formulation than the Navier-Stokes equations and is valid in a larger flow regime. In this paper, the potential of the topology optimization approach is illustrated by a two-dimensional diffuser problem. Moreover, we will show how the domain size may affect the optimum design.

کلمات کلیدی:

Flow optimization Topology optimization Lattice Boltzmann method Sensitivity analysis

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