國立交通大學應用數學系
學術演講公告

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講　題：An efficient threshold dynamics method for topology optimization for fluids

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Abstract

We propose an efficient threshold dynamics method for topology optimization for fluids modeled with the Stokes equation. The proposed algorithm is based on minimization of an objective energy function that consists of the dissipation power in the fluid and the perimeter approximated by nonlocal energy, subject to a fluid volume constraint and an incompressibility condition. We show that the minimization problem can be solved with an iterative scheme in which the Stokes problem is approximated by a Brinkman equation and solved with the mixed finite-element method. The indicator functions of the fluid-solid regions are then updated according to simple convolutions followed by a thresholding step. We demonstrate mathematically that the iterative algorithm has the total energy decaying property. The proposed algorithm is simple and easy to implement. Extensive numerical experiments in both two and three dimensions show that the proposed iteration scheme is robust, efficient and insensitive to the initial guess and the parameters in the model.

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