

数学与系统科学研究院  
计算数学所网络学术报告

报告人: **Prof. Xiao-Ping Wang**

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报告题目:

**The numerical methods for topology  
optimisation**

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报告时间: **2020 年 9 月 7 日 (周一)**

**下午 16:00-17:00**

报告工具: **腾讯会议 (ID: 892 916 937)**

会议链接:

<https://meeting.tencent.com/s/dBs9y7lfSLe9>

## **Abstract:**

Topology optimization (TO) is a promising numerical technique for designing optimal engineering designs in many industrial applications. It has become a very useful engineering tool for many new rising technologies such as the additive manufacturing or metal 3D printing.

We propose an efficient and robust iterative thresholding method for topology optimization with applications to fluids and heat transfer system. For the Stokes fluid flow, 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. Generalization to heat transfer system will also be discussed.

**欢迎大家参加！**