

数学与系统科学研究院

计算数学所学术报告

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报告题目:

**Robust structured preconditioning
for large discretized PDEs**

邀请人: 张林波研究员

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上午 10:30—11:30

报告地点: 科技综合楼三层 311

计算数学所报告厅

Abstract:

We will discuss an approximate structured factorization method for large sparse matrices arising from the discretization of PDEs. The factorization can be used as a fast direct solver or a robust preconditioner. For many discretized PDEs, classical direct or iterative solvers often suffer from difficulties such as high frequencies, large wave numbers, ill conditioning, incompressible limit, etc. In our method, structured approximations are used. Sparse matrix techniques are combined with hierarchically semiseparable factorizations of dense intermediate matrices. Structural compression of dense matrix blocks leads to high efficiency. Robustness enhancement is automatically integrated into the structured factorization with no extra cost. The cost and storage of such a factorization are roughly linear in the problem size. The

factors can work as effective preconditioners without strict structural requirement. The efficiency, robustness, and effectiveness of preconditioning are discussed and demonstrated with examples such as Helmholtz, elasticity, and Maxwell equations. Numerical experiments show that this preconditioner is also relatively insensitive to certain parameters such as frequencies or wave numbers. The method is also highly parallelizable.

欢迎大家参加！