数学与系统科学研究院

计算数学所定期学术报告

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报告题目：

CONTINUOUS INTERIOR PENALTY FINITE ELEMENT METHODS FOR THE HELMHOLTZ EQUATION WITH LARGE WAVE NUMBER

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报告时间：2011 年 4 月 28 日（周四）

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报告地点： 科技综合楼三层 311

计算数学所报告厅

Abstract：

This paper develops and analyzes some continuous interior penalty finite element methods (CIP-FEMs) using piecewise linear polynomials for the Helmholtz equation with the first order absorbing boundary condition in the two and three dimensions. The novelty of the proposed methods is to use complex penalty parameters with positive imaginary parts. It is proved that the proposed CIP-FEMs are stable (hence well-posed) without any mesh constraint and satisfy the error estimates $C_1 kh + C_2 \min(k^3 h^2, 1 + 11/|\gamma|)$ in the broken H^1-norm when kh is bounded, where γ is the penalty parameter, k is the wave number, and h is the mesh size. Optimal order L^2 error estimates are also derived. By taking $\gamma \to 0$, the above estimates are extended to the linear finite element methods under the condition that $k^3 h^2$ is small enough. Numerical results are provided to verify the theoretical findings. It is shown that the penalty parameter may be tuned to greatly reduce the pollution errors.

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