数学与系统科学研究院

计算数学所博士后定期学术报告

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报告题目：

FEM and CIP-FEM for Helmholtz equation with high wave number and perfectly matched layer truncation

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311 报告厅

Abstract:

The linear Helmholtz scattering problem with high wave number is truncated by the perfectly matched layer (PML) technique and then discretized by finite element method (FEM) and continuous interior penalty finite element method (CIP-FEM). It is proved that the truncated PML problem satisfies the inf-sup condition with inf-sup constant of order O(1/k). Stability and convergence of the truncated PML problem are discussed. In particular, the convergence rate is better than the previous result. The preasymptotic error estimates in the energy norm of the linear CIP-FEM as well as FEM are proved to be C_1kh+C_2k^3h^2 under the mesh condition that k^3h^2 is sufficiently small. Especially, the estimates of the p-degree (CIP-)FEM are discussed for the one dimensional Helmholtz problem when k^{p+2}h^{p+1} is small enough. Numerical tests are provided to illustrate the preasymptotic error estimates and show that the penalty parameter in the CIP-FEM may be tuned to reduce greatly the pollution error. Moreover, the nonlinear Helmholtz equation with PML truncation is discussed. The stability and convergence of the nonlinear PML solution are derived with explicit dependence on the wave number. The well-posedness and preasymptotic error estimates of both the FEM and its iterative method are proved. Some numerical tests for the relevant problem of nonlinear optics are carried out.

欢迎大家参加！