Mathematisches Seminar

des Sonderforschungsbereichs 393

Numerische Simulation auf

massiv parallelen Rechnern

Zeit: Donnerstag, 21.01.1999, 9.00 Uhr

Ort: Reichenhainer Straße 70, B201

Vortragender: Prof. L. Tobiska (Uni Magdeburg)

Thema: Properties of the Streamline-Diffusion Finite Element Method on a Shishkin Mesh for Singularly Perturbed

On the unit square, we consider a singularly perturbed convection-diffusion boundary value problem whose solution has exponential boundary layers along two sides of the square. We use the streamline-diffusion finite element method (SDFEM) with piecewise bilinear trial functions on a Shishkin mesh of $O(N^2)$ points and show that it is convergent, uniformly in the diffusion parameter ε, of order $\varepsilon^{1/2}N^{-1}\ln^{3/2} N + N^{-3/2}$ to its bilinear interpolant in the usual streamline-diffusion norm. As a corollary we prove that the method is convergent of order $\varepsilon^{1/2}N^{-1/2}\ln^2 N + N^{-1/2}\ln^{3/2} N$ (again uniformly in ε) in the local L^∞ norm on the fine part of the mesh (i.e., inside the boundary layers). This local L^∞ estimate within the layers can be improved to order $\varepsilon^{1/2}N^{-1/2}\ln^2 N + N^{-1}\ln^{1/2} N$, uniformly in ε, away from the corner layer. We present numerical results to support these results and to examine the effect of replacing bilinear trials with linear trials in the SDFEM.

Interessenten sind herzlich eingeladen.

A. Meyer