

论文

PARAMETER-UNIFORM FINITE DIFFERENCE SCHEME FOR A SYSTEM OF COUPLED SINGULARLY PERTURBED CONVECTION-DIFFUSION EQUATIONS

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摘要 A coupled system of singularly perturbed convection-diffusion

equations is considered. The leading term of each equation is

multiplied by a small positive parameter, but these parameters may

have different magnitudes. The solutions to the system have

boundary layers that overlap and interact. The structure of these

layers is analyzed, and this leads to the construction of a

piecewise-uniform mesh that is a variant of the usual Shishkin

mesh. On this mesh an upwind difference scheme is proved to be

almost first-order accurate, uniformly in both small parameters.

We present the results of numerical experiments to confirm our

theoretical results.

关键词 [Convection-diffusion, singular perturbation](#)

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Abstract A coupled system of singularly perturbed convection-diffusion equations is considered. The leading term of each equation is multiplied by a small positive parameter, but these parameters may have different magnitudes. The solutions to the system have boundary layers that overlap and interact. The structure of these layers is analyzed, and this leads to the construction of a piecewise-uniform mesh that is a variant of the usual Shishkin mesh. On this mesh an upwind difference scheme is proved to be almost first-order accurate, uniformly in both small parameters. We present the results of numerical experiments to confirm our theoretical results.

Key words [Convection-diffusion](#) [singular perturbation](#) [solution decomposition](#) [Shishkin mesh](#) [upwind finite difference](#)

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