

Colloquium

On stabilized finite element methods for solving singular perturbation problems

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摘 要：

We will introduce some singular perturbation problems including the Oseen-type equations, the generalized Stokes problem, and the reaction-convection-diffusion equation. It is well known that the solutions of these problems may exhibit localized phenomena such as boundary and interior layers. Boundary and interior layers are narrow regions in the spatial domain where the solution rapidly changes, and it is usually difficult to resolve numerically the high gradients near the layer regions. Therefore, these problems have been the focus of intense research for quite some time. However, most conventional numerical methods are lacking in either stability or accuracy. For example, the standard finite element method with $C0$ linear elements performs poorly for the reaction-convection-dominated problems because large spurious oscillations are frequently exhibited. In this talk, we will present a brief overview of our recently developed stabilized finite element methods for these problems. Some error estimates will be presented and numerical examples are given to confirm the theoretical results.