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Research Announcement

A UNIFORMLY CONVERGENT METHOD FOR A SINGULARLY PERTURBED SEMILINEAR REACTION-DIFFUSION PROBLEM WITH NONUNIQUE SOLUTIONS

Guangfu Sun and Martin Stynes

We analyse a simple central difference scheme for a singularly perturbed semilinear reaction-diffusion problem that may have non-unique solutions. Asymptotic properties of solutions to this problem are examined. To compute accurate approximations to these solutions, we consider a piecewise equidistant mesh of Shishkin type, which contains $O(N)$ points. On such a mesh, we prove existence of a solution to the discretization and show that it is accurate of order $N^{-2} \ln^2 N$, in the discrete maximum norm, where the constant factor in this error estimate is independent of ε and N . Numerical results are presented which verify this rate of convergence. Full details appear in [1].

Reference

- [1] G. Sun and M. Stynes, *A uniformly convergent method for a singularly perturbed semilinear reaction-diffusion problem with nonunique solutions* (1993). (Preprint 1993-11, Mathematics Department, University College Cork.)

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