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Efficient numerical algorithms for solving semilinear singularly perturbed convection-diffusion-reaction systems.

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SUMMARY

In this talk we introduce and analyze a technique to develop numerical algorithms for solving a class of semilinear parabolic singularly perturbed systems of convection-diffusion type which have nonlinear reaction terms. We pay special attention to systems where small diffusion parameters with different orders of magnitude are present; this feature provokes that overlapping boundary layers appear in their solutions, close to the outflow boundary. Our proposal combines a linearized version of the fractional implicit Euler method together with a splitting by components, to discretize in time, and the upwind finite difference scheme on appropriate piecewise uniform meshes, to discretize in space. It is proven and checked that the proposed numerical algorithms are uniformly convergent.

Keywords: singular perturbation, uniform convergence, splitting.

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