



MANAGING ERROR ESTIMATES FOR SEMIDISCRETE FINITE ELEMENT APPROXIMATIONS OF SEMILINEAR PARABOLIC EQUATIONS IN A NONCONVEX POLYGON

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ABSTRACT

In this paper, we consider the semilinear parabolic problems with homogeneous Dirichlet boundary conditions in a two-dimensional nonconvex polygon. We study the semidiscrete error analysis which is based on an error splitting technique together with rigorous regularity analysis of the semilinear parabolic equations. Previously, Chatzipantelidis et al. [BIT Numer. Math., 46 (2006), pp. S113-S143] made an effort to analyze for problems in nonconvex polygons mainly focused on linear models. A special feature in a nonconvex polygon is the presence of singularities in the solutions generated by the corners. Due to the nonlinearity in the forcing term and the non-smoothness of the solution in a nonconvex polygon, the analysis is not straightforward. We establish the convergence in $L^\infty(L^2)$ and $L^\infty(H^1)$ for the semidiscrete finite element solution.

Keywords:- Semilinear parabolic problem, nonconvex polygon, singularity, error estimates

AMS subject classifications— 65M60, 65N15, 65N30
