

Pointwise Nonlinear Scaling for Reaction-Diffusion Equations

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Parabolic reaction-diffusion systems may develop sharp moving reaction fronts which pose a challenge even for adaptive finite element methods. We propose a method to transform the equation into an equivalent form that usually exhibits solutions which are easier to discretize, giving higher accuracy for a given number of degrees of freedom. The transformation is realized as an efficiently computable pointwise nonlinear scaling that is optimized for prototypical planar travelling wave solutions of the underlying reaction-diffusion equation. The gain in either performance or accuracy is demonstrated on different numerical examples.