# METHOD OF LINES FOR PSEUDOPARABOLIC EQUATIONS

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We consider initial-boundary-value problems for a class of pseudoparabolic partial differential equations.

Let $T > 0$, $\varepsilon > 0$ and $\Omega \subset \mathbb{R}^n$ be a bounded domain with a boundary $\partial\Omega$ which is sufficiently smooth. We consider the pseudoparabolic equation

$$\frac{\partial}{\partial t}(u - \varepsilon\Delta u) = F(x, t, u) \quad \text{on} \quad \Omega \times [0, T]$$

with the initial and boundary conditions

$$u(x, 0) = \varphi(x) \quad \text{for} \quad x \in \Omega, \quad u(x, t) = 0 \quad \text{on} \quad \partial\Omega \times [0, T],$$

where $F : \overline{\Omega} \times [0, T] \times \mathbb{R} \to \mathbb{R}$, $\varphi : \overline{\Omega} \to \mathbb{R}$ are given continuous functions and $\Delta$ is the Laplace operator with respect to $x$.

Local-in-time existence results and nonexistence of global-in-time solutions are proved. We construct the method of lines to approximate pseudoparabolic equations by systems of ordinary differential equations. We present a complete convergence analysis for this semidiscretization method. A blow-up for approximate solutions is showed. Numerical experiments confirm the theoretical results.