
The authors put forward parallel Galerkin domain decomposition methods for parabolic partial differential equations with homogeneous Neumann conditions on domains of dimension between one and three. Implicit Galerkin methods are used on the subdomains, and either an explicit flux calculation on the interdomain boundaries by an integral mean method or extrapolation serve to predict the inner-boundary conditions. $L^2$-norm error bounds are proven for both procedures, which improve earlier results. The procedures are conservative both in the subdomains and across interboundaries. The explicit nature of the flux prediction induces a step-size restriction necessary to preserve stability. Numerical experiments illustrate the theoretical results.

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MSC:

65M55 Multigrid methods; domain decomposition for initial value and initial-boundary value problems involving PDEs
65M60 Finite element, Rayleigh-Ritz and Galerkin methods for initial value and initial-boundary value problems involving PDEs
65M15 Error bounds for initial value and initial-boundary value problems involving PDEs
35K15 Initial value problems for second-order parabolic equations
65Y05 Parallel numerical computation
65M12 Stability and convergence of numerical methods for initial value and initial-boundary value problems involving PDEs

Keywords:
domain decomposition method; implicit Galerkin method; error bounds; parallel computation; extrapolation method; integral mean method; parabolic equation; stability; numerical experiments

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References:


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