Stochastic Algorithm for Solving the Wigner-Boltzmann Correction Equation

M. Nedjalkov, S. Selberherr, I. Dimov

For the solution of convection-diffusion problems we present a multilevel self-adaptive mesh-refinement algorithm to resolve locally strong varying behavior, like boundary and interior layers. The method is based on discontinuous Galerkin (Baumann-Oden DG) discretization. The recursive mesh-adaptation is interwoven with the multigrid solver. The solver is based on multigrid V-cycles with damped block-Jacobi relaxation as a smoother. Grid transfer operators are chosen in agreement with the Galerkin structure of the discretization, and local grid-refinement is taken care of by the transfer of local truncation errors between overlapping parts of the grid.
We propose an error indicator based on the comparison of the discrete solution on the finest grid and its restriction to the next coarser grid. It refines in regions, where this difference is too large. Several results of numerical experiments are presented which illustrate the performance of the method.
The approach shows the advantages of combining adaptive meshing, multilevel techniques and discontinuous Galerkin discretization.