Comparison of CMFD and p-CMFD Acceleration Methods for Neutron Transport Calculations

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Abstract

Partial current-based coarse mesh finite difference (p-CMFD) acceleration of the 3D whole-core transport calculation is described and its convergence/stability is compared with conventional CMFD for a varying degree of coarseness and mesh sizes. The results of the Fourier stability analysis and numerical tests show that p-CMFD is a significant improvement over CMFD in that p-CMFD is unconditionally stable except for the coarseness p=1 (i.e., fine-mesh acceleration case), while CMFD is divergent for all p's in the mesh size interval of ~0.5 < h < ~10 when c is high and this interval becomes larger as p increases. A drawback of p-CMFD, however, is the loss of its acceleration effectivenss as the mesh size h becomes large (as is CMFD).

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Coarse-Mesh Angular Dependent Rebalance Acceleration Method in X-Y Geometry

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Abstract

We extend the coarse-mesh angular dependent rebalance acceleration method (CMADR) recently proposed by the authors to x-y geometry neutron transport calculations and apply it with diamond-difference and constant-constant nodal discretizations. Similarly to the one-dimensional case, the S_2-like rebalance factors are angular dependent and defined on coarse mesh boundaries only. Thenumerical tests show that CMADR method is very effective in reducing the number of iterations.