The Additive Angular Rebalance Acceleration Method for Solving Neutron Transport Equations in X-Y Geometry

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Abstract

The additive angular dependent rebalance (AADR) factor acceleration method proposed by the authors previously is an effective acceleration method for the the discrete ordinates neutron transport equation. For slab geometry problems, it was demonstrated via Fourier analysis that the spectral radius of the AADR method is less than that of diffusion synthetic acceleration (DSA) method. In this paper, a continuous Fourier analysis is performed for x-y geometry to analyze the stability of the additive angular dependent rebalance factor method. As a result, the optimal weighting functions can be obtained. We also suggest an AADR with directional S_2-like weighting functions to get better convergence. The Fourier analysis shows that the AADR with directional S_2-like weighting functions which uses two different rebalance factors for x and y directions per octant provide better results than the AADR with normal S_2-like weighting functions which uses a single weighting function per octant. Numerical tests also confirm our suggestion