Cell Based CMFD Formulation for Acceleration of Whole-core Method of Characteristics Calculations

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Abstract

This paper is to apply the well-established coarse mesh finite difference(CMFD) method to the method of characteristics(MOC) transport calculation as an acceleration scheme. The CMFD problem is first formulated at the pin-cell level with the multi-group structure. To solve the cell-based multi-group CMFD problem efficiently, a two-group CMFD formulation is also derived from the multi-group CMFD formulation. The performance of the CMFD acceleration is examined for three test problems with different sizes including a realistic quarter core PWR problem. The CMFD formulation provides a significant reduction in the number of ray tracings and thus only about 10 ray tracing iterations are enough for the realistic problem. In computing time, the CMFD accelerated case is about two-three times faster than the coarse-mesh rebalancing(CMR) accelerated case.

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A New Acceleration Method of Additive Angular Dependent Rebalance with Extrapolation for Discrete Ordinates Transport Equation

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Abstract

A New extrapolation method is developed and applied to the addtive angular dependent rebalance (AADR) acceleration for discrete ordinates neutron transport calculations. With this extrapolation, the convergence of AADR solution for distinct discretizations between the high-order and low-order equations in remarkably improved and thus the " inconsistent discretization problem" is resolved. Fourier analysis is also performed to find the optimal extrapolation and weighting parameters, which give the smallest spectral radius. The numerical tests demonstrate that the AADR with extrapolation works well as predicted by the Fourier analysis.