A High-Order Nodal Method Based on the Function Expansion, Subcell Balances for Even-Parity Transport Problems

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Abstract

In this paper, a new high-order nodal method based on the function expansion, subcell balances for solving the discrete ordinates even-parity transport problems in slab geometry is presented. Two methods are devised to expand the even-parity angular flux : polynomial expansion (four terms including constant) and analytic eigenfunction expansion (five terms including constant particular solution). To derive the coupling equations, the continuity conditions of interface odd-parity angular flux and subcell balances are used. The numerical results are compared with those of diamond difference (DD) and linear moment (LM) methods for the first-order form transport equation. The results show that the method of analytic eigenfunction expansion gives more accurate solutions than DD and LM but that the method of polynomial expansion is less accurate than LM or more accurate than LM (depends on the problems). For S4 angular quadrature set, it is shown that the method of analytic eigenfuction expansion is an exact differencing scheme (no truncation error).