

A Multigrid Method to Compute the Dominant Lambda Modes of a Nuclear Reactor

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ABSTRACT

High accuracy in discretization is required for the integration of the lambda modes problem for the neutron diffusion equation. Finite element method is a discretization technique that handles easily different meshes. In [1] used a h - p finite element method has been developed to obtain the dominant Lambda modes, and it is shown that the method converges if the mesh is refined or the degree of the polynomial expansions is increased. However, the computational cost increased a lot with these techniques, since the matrix sizes and the dimension eigenvalue problem increases considerably.

In this work, a multigrid method based on finite element method have been proposed where the finite elements are spatially subdivided into smaller ones using structured and unstructured mesh, implemented in the library deal.II [2]. To solve the eigenvalue problems, a method based on modified block Newton method [3] is presented, where the solution in a coarse mesh is used as initial solution for the solution of the problem in a mesh with higher level of refinement. To study the performance of this method, several benchmark problems will be presented.

REFERENCES

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