Abstracts

Robust finite-element solution of lossy and unbounded electromagnetic eigenvalue problems

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An efficient algorithm is presented for the finite-element solution of electromagnetic eigenvalue problems associated with lossy and unbounded structures. The algorithm is based on the E/spl I.oarr/ - B/spl I.oarr/ formulation of the finite-element approximation of the electromagnetic equations. The special relationship between the vector bases used for the expansion of the electric field vector E/spl I.oarr/ and the magnetic flux density vector B/spl I.oarr/ is used to reduce the computational complexity of the proposed formulation. The occurrence of spurious DC modes is avoided through the careful selection of divergence-free initial vectors in the Lanczos-Arnoldi-based iterative schemes used by the proposed algorithm. The resultant algorithm is only marginally more expensive than standard finite-element-based algorithms used for electromagnetic eigenvalue problems involving lossless structures. Numerical experiments from the application of the proposed algorithm to the eigenvalue analysis of both lossless and lossy cavities are used to demonstrate its accuracy, computational efficiency, and robustness.

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