Boundary element methods for Maxwell eigenvalue problems

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For the numerical solution of Maxwell eigenvalue problems we propose a boundary element method which is used to solve equivalent nonlinear eigenvalue problems for related boundary integral operators [1,2]. The boundary integral formulations of Maxwell eigenvalue problems and their Galerkin discretization are analyzed in the framework of eigenvalue problems for holomorphic Fredholm operator-valued functions. For the numerical solution of the discretized eigenvalue problems we use the so-called contour integral method [3] which reduces the algebraic nonlinear eigenvalues problem to linear ones. The method is based on a contour integral representation of the resolvent operator and it is suitable for the extraction of all eigenvalues which are enclosed by a given contour. The dimension of the resulting linear eigenvalue problem corresponds to the number of eigenvalues inside the contour. The main computational effort consists in the evaluation of the resolvent operator for the contour integral which requires the solution of several linear systems involving boundary element matrices.

References


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