Abstracts

Unequal-Arm Finite-Difference Operators in the Positive-Definite Successive Over-relaxation (PDSOR) Algorithm

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In an earlier publication, a procedure was described that permitted the application of successive overrelaxation (SOR) to the solution of higher modes of any uniform waveguide of arbitrary cross section, filled with an isotropic and homogeneous medium. An algorithm was described that employed a thirteen-point finite-difference operator formed from five constituent five-point operators, such that the resulting matrix was positive semidefinite at the correct eigenvalue and was positive definite otherwise. For compactness the method is called positive definite successive overrelaxation (PDSOR). For simplicity boundary fitting was accomplished by causing horizontal waveguide deformations at each horizontal mesh line to the nearest node point. This paper describes an improvement of the PDSOR algorithm to cater for unequal-armed operators so that the waveguide wall need not be distorted from its actual shape. Improved accuracy is obtained for fields in the vicinity of the boundary and for eigenvalues. A finite-difference first-order perturbation method (that makes use of the accurately determined wall currents) for attenuation in arbitrarily shaped waveguides is described. Normalized curves are presented giving attenuation of sets of TE and TM modes in circular, lunar, T-septate lunar, single-ridge, and T-septate rectangular waveguides.

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