Abstracts

Variational Solution of Integral Equations

B.H. McDonald, M. Friedman and A. Wexler. "Variational Solution of Integral Equations." 1974 Transactions on Microwave Theory and Techniques 22.3 (Mar. 1974 [T-MTT] (Special Issue on Computer-Oriented Microwave Practices)): 237-248.

A variational solution of the Fredholm integral equation of the first kind resulting from Laplace's equation with Dirichlet boundary conditions is discussed. Positive-definiteness of the integral operator is used to guarantee convergence. The square parallel plate capacitor is given as an example with several different types of trial functions. Special singular functions to handle known field behavior are shown to result in improved accuracy with reduced computing cost. The air-dielectric interface condition is related to a general Neumann-mixed boundary condition for which a variational method with a positive-definite integral operator is presented. Multiple boundary conditions are handled by mutually constraining separate variational expressions for each boundary condition. A T-shaped conductor on a dielectric slab, representative of quasi-static solutions of microstrip discontinuities, is presented as a three-dimensional example with multiple boundary conditions. Generally, it is shown how the finite-element method for the solution of partial differential equations may be extended to handle integral equation formulations.

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