Abstracts

A new algorithm for the incorporation of arbitrary linear lumped networks into FDTD simulators

J.A. Pereda, F. Alimenti, P. Mezzanotte, L. Roselli and R. Sorrentino. "A new algorithm for the incorporation of arbitrary linear lumped networks into FDTD simulators." 1999 Transactions on Microwave Theory and Techniques 47.6 (Jun. 1999, Part II [T-MTT]): 943-949.

The inclusion of lumped elements, both linear and nonlinear, into the finite-difference time-domain (FDTD) algorithm has been recently made possible by the introduction of the lumped element FDTD method. Such a method, however, cannot efficiently and accurately account for two-terminal networks made of several lumped elements, arbitrarily connected together. This limitation can be removed as proposed in this paper by describing the network in terms of its impedance in the Laplace domain and by using appropriate digital signal-processing methodologies to fit the resulting description to Yee's algorithm. The resulting difference equations allow an arbitrary two-terminal network to be inserted into one FDTD cell, preserving the full explicit nature of the conventional FDTD scheme and requiring a minimum number of additional storage variables. The new approach has been validated by comparison with the exact solution of a parallel-plate waveguide loaded with lumped networks in the transverse plane.

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