Abstracts

A Subgridding Method for the Time-Domain Finite-Difference Method to Solve Maxwell's Equations

S.S. Zivanovic, K.S. Yee and K.K. Mei. "A Subgridding Method for the Time-Domain Finite-Difference Method to Solve Maxwell's Equations." 1991 Transactions on Microwave Theory and Techniques 39.3 (Mar. 1991 [T-MTT]): 471-479.

The time-domain finite-difference method (TDFDM) gives accurate results for the calculation of electromagnetic wave propagation but uses a large amount of computer memory. This paper investigates a modification to this technique that employs a variable step size. The entire computational volume is divided into a coarse grid with a large step size; a fine grid with a small step size is introduced only around discontinuities. The corresponding time increments will be related to the spatial increments with the same ratio in order to minimize the numerical dispersion. The fields within both the coarse and fine grids are found using the TDFDM while an interpolation in both space and time is utilized to calculate the tangential electric field on the coarse-fine grid boundary. This subgridding decreases the required computer memory and therefore expands the capability of the TDFDM. The technique is shown to be numerically stable, and does not entail any extra numerical error. Finally, the method is applied to the calculation of waveguides and microstrips.

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