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Electromagnetic Wave Propagation Equations in 2D by Finite Difference Method

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Abstract : In this paper, the techniques to solve time dependent electromagnetic wave propagation equations based on the Finite Difference Method (FDM) are proposed by comparing the results with Finite Element Method (FEM) in 2D while discussing some special simulation examples. Here, 2D dynamical wave equations for lossy media, even with a constant source, are discussed for establishing symbolic manipulation of wave propagation problems. The main objective of this contribution is to introduce a comparative study of two suitable numerical methods and to show that both methods can be applied effectively and efficiently to all types of wave propagation problems, both linear and nonlinear cases, by using symbolic computation. However, the results show that the FDM is more appropriate for solving the nonlinear cases in the symbolic solution. Furthermore, some specific complex domain examples of the comparison of electromagnetic waves equations are considered. Calculations are performed through Mathematica software by making some useful contribution to the programme and leveraging symbolic evaluations of FEM and FDM.

Keywords : finite difference method, finite element method, linear-nonlinear PDEs, symbolic computation, wave propagation equations
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