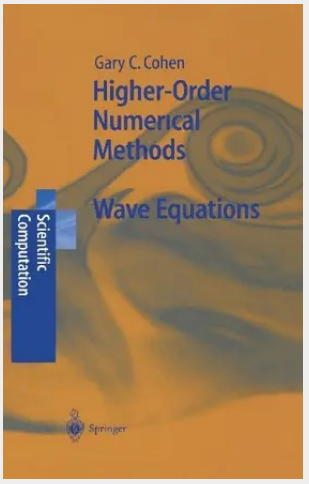
Cohen

Higher-Order Numerical Methods for Transient Wave Equations



Solving efficiently the wave equations involved in modeling acoustic, elastic or electromagnetic wave propagation remains a challenge both for research and industry. To attack the problems coming from the propagative character of the solution, the author constructs higher-order numerical methods to reduce the size of the meshes, and consequently the time and space stepping, dramatically improving storage and computing times. This book surveys higher-order finite difference methods and develops various mass-lumped finite (also called spectral) element methods for the transient wave equations, and presents the most efficient methods, respecting both accuracy and stability for each sort of problem. A central role is played by the notion of the dispersion relation for analyzing the methods. The last chapter is devoted to unbounded domains which are modeled using perfectly matched layer (PML) techniques. Numerical examples are given.

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