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Efficient Finite Difference Schemes for Designing Electromagnetic Devices

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Electromagnetic simulation has been recognized as an essential tool for designing various electromagnetic devices. Computational methods based on the finite-difference scheme have become immensely popular, since their formulations are relatively simple, computational modelling is easy, and efficient performance can be achieved using recent high-speed computers. The finite-difference scheme in time-domain (FDTD) and that in frequency-domain (FDFD) are the most common methods and they are very effective for designing some specific components of such as thin films [1], guided wave structures [2], [3], nano antennas [4], [5]. Recently, the authors extended the FDFD formula into the complex frequency domain and proposed a novel combination technique to obtain time-frequency responses of electromagnetic waves efficiently [6].

In this presentation, the authors discuss computational efficiency and accuracy of those finite-difference schemes and introduce their applications for electromagnetic devices. Acceleration of computation will be proposed in terms of parallel algorithm.

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