

Conventional Computational Electromagnetics Toward Nanoscale, Optical, and Plasmonic Applications

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EXTENDED ABSTRACT

Over the last six decades, many computational electromagnetics (CEM) methods have been developed for the analysis and design of communication systems, optoelectronic and biomedical devices, MEMs, and most of the other electronic devices. We have also experienced the tremendous impact of CEM methods in remote sensing, EMC/EMI analysis, chip design, and geophysical prospecting. Even though all of these methods have been solving Maxwell's equations fully or approximately, they might differ dramatically from each other depending on their applications. In some scenarios, frequency domain solvers (MoM [1, 2, 3], FEM [2, 3, 4], and FMM [2, 3, 5]) are more efficient than time domain methods (FDTD [6, 7] and PSTD [7, 8]) or vice versa. In some cases implementation of periodic Green's functions in an integral equation solver is sufficient for 1 per cent of error whereas sometimes one has to use the fast multipole method to solve that large problem of finite periodicity. No matter which approach is followed for the development of an algorithm, the question is, does this algorithm also work in the optical regime? Or for an algorithm working for microwave, is converting "permittivity" from a real variable to a complex variable enough to handle metamaterials or plasmonic structures? In this talk, I will try to answer these questions and explain how we can push the frontiers of conventional computational electromagnetics toward nanoscale, optical, and plasmonic applications.

KEYWORDS: Computational electromagnetics, optics, plasmonics, and metamaterials.

BIOGRAPHY

ERGUN SIMSEK received his B.Sc. degree in electrical and electronics engineering from Bilkent University

(Ankara, Turkey) in 2001, and his M.S. and Ph.D. degrees in electrical engineering from University of Massachusetts Dartmouth (Dartmouth, MA, USA) and Duke University (Durham, NC, USA), in 2003 and 2006, respectively. After completion of his Ph.D. degree, he was appointed as a postdoctoral research associate at Schlumberger-Doll Research (Cambridge, MA, USA). In August 2008, he joined the faculty of Bahcesehir University (Istanbul, Turkey), where he is currently an Assistant Professor of Electrical and Electronics Engineering.

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