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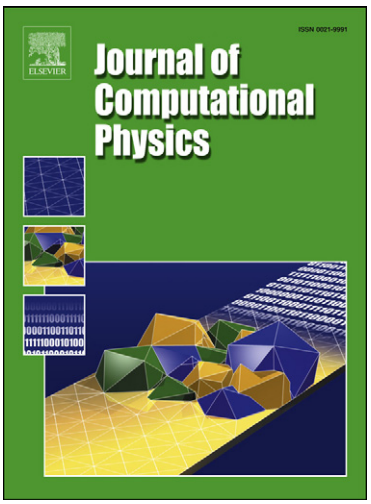

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Extension of the Lorenz-Mie-Debye method for electromagnetic scattering to the time-domain

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Abstract

In this paper, we extend the frequency domain Lorenz-Mie-Debye formalism for the Maxwell equations to the time domain. In particular, we show that the problem of scattering from a perfectly conducting sphere can be reduced to the solution of two scalar wave equations - one with Dirichlet boundary conditions and the other with Robin boundary conditions. An explicit, stable, and high-order numerical scheme is then developed, based on our earlier treatment of the scalar case. This new representation may provide some insight into transient electromagnetic phenomena, and can also serve as a reference solution for general purpose time-domain software packages.

Keywords: Maxwell equations, Debye potentials, Mie series, vector spherical harmonics.
2000 MSC: 65M70, 78A40, 78M16

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