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**A multilevel local discrete convolution method for the numerical solution for Maxwell's Equations**[1] BORIS LO, University of California, Berkeley, PHILLIP COLELLA, Lawrence Berkeley National Laboratory — We present a new discrete multilevel local discrete convolution method for solving Maxwell's equations in three dimensions. We obtain an explicit real-space representation for the propagator of an auxiliary system of differential equations with initial value constraints that is equivalent to Maxwell's equations. The propagator preserves finite speed of propagation and source locality. Because the propagator involves convolution against a singular distribution, we regularize via convolution with smoothing kernels (B-splines) prior to sampling. We have shown that the ultimate discrete convolutional propagator can be constructed to attain an arbitrarily high order of accuracy by using higher-order regularizing kernels and finite difference stencils. The discretized propagator is compactly supported and can be applied using Hockney's method (1970) and parallelized using domain decomposition, leading to a method that is computationally efficient. The algorithm is extended to work for locally refined fixed hierarchy of rectangular grids.

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