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Time Domain Propagation of Quantum and Classical Systems using a Wavelet Basis Set Method RICHARD LOMBARDINI, EWA NOWARA, St. Mary's University (San Antonio, TX), BRUCE JOHNSON, Rice University — The use of an orthogonal wavelet basis set (Optimized Maximum-N Generalized Coiflets) to effectively model physical systems in the time domain, in particular the electromagnetic (EM) pulse and quantum mechanical (QM) wavefunction, is examined in this work. Although past research has demonstrated the benefits of wavelet basis sets to handle computationally expensive problems due to their multiresolution properties, the overlapping supports of neighboring wavelet basis functions poses problems when dealing with boundary conditions, especially with material interfaces in the EM case. Specifically, this talk addresses this issue using the idea of derivative matching creating fictitious grid points (T.A. Driscoll and B. Fornberg), but replaces the latter element with fictitious wavelet projections in conjunction with wavelet reconstruction filters. Two-dimensional (2D) systems are analyzed, EM pulse incident on silver cylinders and the QM electron wave packet circling the proton in a hydrogen atom system (reduced to 2D), and the new wavelet method is compared to the popular finite-difference time-domain technique.

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