The Transfinite Element Time-Domain Method

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This talk presents a novel method for solving time-domain electromagnetic wave propagation in a microwave structure. The procedure utilizes high-order vector bases to achieve high-order accuracy in space, Newmark's method to obtain an unconditionally stable time-marching scheme, and the transfinite element method to truncate the waveguide sections of the microwave structure. The resulting system matrix is real, symmetric, positive-definite and because of its hierarchical structure, it can be solved by a highly efficient multilevel preconditioned conjugate gradient method. Since the method allows large time steps and nonuniform grids to be used, the computational complexity for problems with irregular geometries is superior to the finite-difference time-domain method.