## A Multiresolution Algorithm for Surface Scattering Analysis

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Time domain algorithms based on integral equations are efficient in the transient analysis of scattering problems. Wavelet-based multiresolution analysis has proven to be an effective method in the analysis of electrically large structures. In our previous work, we proposed a new method adopting adaptive basis functions to expand the input and the solution to reduce the number of unknowns. The essence of the method is to use only the most effective and necessary basis functions to represent the solution. Wavelets are a natural choice for multiresolution analysis because they can capture the local as well as the global properties of the solutions efficiently and it is easy to add or discard local, higher order resolutions. We have obtained satisfactory results when the algorithms have been applied to straight and arbitrary wire scatterers. The algorithms are based on the fact that the distribution of the induced transient current along the wire scatterers varies greatly in amplitude with time and space. It is not necessary to explicitly compute the solution on the wire where negligible responses is obvious, and there is no need to compute potential at every point and perform integration through the whole wire length.

In this presentation we implement an algorithm that can be used to analyze surface scatterers by grids of wires. In our time domain integral equation-based algorithm, the sets of spatial basis functions are updated at each time step based on the previous results. Several numerical examples are presented, where the transient currents induced on surface structures are calculated from the multiresolution method and conventional non-multiresolution methods. The comparison of the results shows the effectiveness of the multiresolution algorithm: comparable accuracy with reduced computational cost. It provides a systematic way to reduce the computational cost in scattering analysis in ultra-wide band applications.