USE OF HIGHER ORDER ENTIRE DOMAIN BASIS OVER ELECTRICALLY LARGE SUBSECTIONAL PATCHES

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ABSTRACT: The use of higher order entire domain basis over large surface patches can be quite advantageous for efficient and accurate solution of electromagnetic field problems. The incorporation of such formulations in WIPL-D has made solution of large problems on desktops a reality.

For example, use of entire domain higher order basis can guarantee continuity of the charge over the surface of the structure and will thus result in a more accurate solution for the input impedance for radiation problems, accurate near field results and faster overall convergence as evidenced in WIPL-D.

In addition, it can reduce the undesired instabilities for solutions of the currents when using an electric field integral equation near internal resonant frequencies. It is well known that the electric field integral equation breaks down at frequencies near the internal resonant frequencies of the structure. However, when using higher order basis over large surface patches it will be demonstrated that the region of instability in the solution is dramatically reduced and can provide quite meaningful solutions without much problem.

Finally, regarding the efficiency of the solution procedure we know that when subsectional basis functions like the triangular patch is used to discretise a surface typically one needs approximately 100-300 unknowns per square wavelength of surface area to approximate the surface current. However, when using higher order basis in conjunction with entire domain functions over large patches that number can be reduced to 10-30 unknowns per square wavelength of surface area. That leads to a dramatic reduction in the size of the matrix and electrically large problems, which for the subsectional basis require a super computer to solve, can now be analyzed on desktop computers. More interestingly as the electrical size of the patch increases, the number of basis functions per unit square wavelength of surface area actually *decreases*!

The presentation will illustrate these points with examples.