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WAVELETS IN ELECTROMAGNETICS: THE IMPEDANCE MATRIX COMPRESSION (IMC) METHOD

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SUMMARY

The use of wavelet expansions in numerical solutions of electromagnetic frequency-domain integral equation formulations is steadily growing. In this paper we review the recently suggested impedance matrix compression (IMC) method for a more effective integration of wavelet-based transforms into existing numerical solvers. The difference between the IMC method and the previous approaches to applying wavelets in computational electromagnetics is twofold. Firstly, the transformation is effected by means of a digital filtering approach. This approach renders the transform algorithm adaptive and facilitates the derivation of a basis which best suits the problem at hand. Secondly, the conventional thresholding procedure applied to the impedance matrix is substituted for by a compression process in which only the significant terms in the expansion of the (yet-unknown) current are retained and hence a substantially smaller number of coefficients has to be determined. A few numerical results are included to demonstrate the advantages of the presented method over the currently used ones. The feasibility of ensuring a slow growth in the number of unknowns even when there is a rapid increase in the problem complexity is shown by an illustrative example. © 1998 John Wiley & Sons, Ltd.