

Parallel finite element analysis for microwave frequency electromagnetic fields using numerical human models

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This paper describes large-scale analyses of electromagnetic fields by the parallel finite element method with an iterative domain decomposition method using numerical human body models. High-speed techniques in operations involving a complex data type etc for High-Performance Computing Infrastructure (HPCI) is applied in the iterative domain decomposition method. Numerical human body models by National Institute of Information and Communications Technology (NICT) in Japan composed by the voxel data include skins, blood vessels, bones etc. and internal organs distinguishing with the material flag. The mesh is efficiently divided by using the domain decomposition data structure when elements of 1 billion or more are generated from the voxel data of NICT numerical human body models. Numerical analyses are done using torso models and whole body models. The results prove that our method can precisely predict the distribution of the electromagnetic field in human bodies inside.

Keywords: Hierarchical domain decomposition method, Finite element method, Large-scale analysis, NICT numerical human model