Parallel implementation of complexity reduction approach to fourth order approximation on 2D free space wave propagation.

ABSTRACT

Recently, a new variant of FDTD method known as High Speed Low Order FDTD (HSLO-FDTD) shows to solve 1D electromagnetic problem faster than the standard FDTD method by 67%. Application of parallel strategy to the method for 2D electromagnetic problem gain better saving in computational time to the parallel FDTD method by 85.2%. This method is called Ultra High Speed Low Order FDTD (UHSLO-FDTD). Both method applies the second order discretization with complexity reduction approach. In this paper, fourth order discretization with complexity reduction approach have succeeds to improve the accuracy of UHSLO-FDTD method. However, the fourth order scheme need higher computational time than UHSLO-FDTD method, but still faster than the FDTD method. This fourth order scheme is called Ultra High Speed High Order Finite Difference Time Domain (UHSHO-FDTD) method. In this paper we solve 2D wave propagation problems on a Symmetrical Multiprocessor machine using message-passing interface. We examine the parallelism efficiency of the algorithm by analyzing the simulation time and speedup.

Keyword: Finite difference method; Complexity reduction approach; Free space wave propagation.