A METHOD OF BOUNDARY EQUATIONS FOR UNSTEADY HYPERBOLIC PROBLEMS IN 3D

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We discuss the interior and exterior initial boundary value problems for the three-dimensional wave (d'Alembert) equation. First, a given problem is reduced to an equivalent operator equation with respect to the unknown sources defined only at the boundary of the original domain. By applying the Huygens' principle, we obtain the operator equation in a form that involves only finite and non-increasing pre-history of the solution in time. Then, the resulting boundary operator equation is discretized and solved by the method of difference potentials [1]. The overall numerical algorithm enables high order accuracy while allowing for non-conforming boundaries to be handled on regular structured grids. For long simulation times, it offers sub-linear complexity with respect to the grid dimension, i.e., is asymptotically cheaper than the cost of a typical explicit scheme. In addition, on multi-processor (or multi-core) platforms, the algorithm benefits from parallelization in time [2].

As the time of presentation permits, we may also address the initial aspects of generalization to systems.

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