Transient Boundary Element Method and Numerical Evaluation of Retarded Potentials

Elke Ostermann[1] Ernst P. Stephan[2] M. Maischak[3]

We will present our latest results concerning the modeling of transient wave propagation using the boundary element method. The special structure of the fundamental solution of the wave equation leads to a close interaction of space and time variables in a so-called retarded time-argument. The corresponding retarded potentials lead naturally to sparse matrices in contrast to the dense matrices usually associated with the BEM, but in each time step the matrix has to be stored, creating a history of matrices. The sparsity of these matrices is a result of the intersection of the domain of influence of an element with the boundary domain, such that the actual number of interacting elements is rather small. In this talk we discuss non-nearfield-like singularities of the retarded potentials and their consequence for the numerical evaluation of the Galerkin integrals.

Moreover, we present stable numerical simulations for the transient sound radiation in three dimensions using the developed quadrature scheme.

References:

[1] E. P. Stephan, M. Maischak, E. Ostermann. *Transient Boundary Element Method and Numerical Evaluation of Retarded Potentials*, Computational Science – ICCS 2008, LNCS, no. 5102, pp. 321–330

[1]Leibniz Universität Hannover, Institut für Angewandte Mathematik, Welfengarten 1, 30167 Hannover, Germany,
osterman@ifam.uni-hannover.de
[2]Leibniz Universität Hannover, Institut für Angewandte Mathematik, Welfengarten 1, 30167 Hannover, Germany,
stephan@ifam.uni-hannover.de
[3]Brunel University, School of Information Systems, Computing & Mathematics, UK,
matthias.maischak@brunel.ac.uk