Technische Universität Braunschweig

MUSEN

Time Domain BEM: Space-Time Methods and Data Sparse Representation

Lecture of

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27. Juni 2019, 16.45 Uhr

Okerhochhaus, Pockelsstraße 3,
Seminarraum EG

The boundary element method in time domain is, in principle, the preferable method for wave propagation in unbounded domains. However, despite the fact that the underlying integral equations are known since a long time and the first numerical realisation has been in the 80th of the last century, a lot of open problems exist and industrial applications are still rare.

Independent of the used time discretisation a suitable 'fast method' is necessary to speed up the BEM and to reduce the storage. Aiming at real world problems, any BE formulation must be accelerated by data-sparse techniques. Here, the Adaptive Cross Approximation (ACA) will be extended to handle BE matrices in space and time, i.e. three dimensional data arrays. The application of this technique is possible in BE formulations using the convolution quadrature method as time discretisation. First results to reduce the storage requirement and the computing time will be presented.

The second part will be an flexible space-time discretisation. For FEM space-time methods have been proposed recently, where unstructured grids in space and time allow adaptivity in both. The space-time approach in BEM is much older but is restricted to a constant step size and adaptivity is difficult to be realised. In the talk, a space-time concept with arbitrary space-time meshes will be presented first for an 1-d example, a truss system, and then for a 3-d acoustic boundary element formulation.