Different Ansatz Functions for the Oscillating Field Variables in an Acoustic Boundary Element Method on exact Geometries

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ABSTRACT

In the frequency domain an acoustical problem is described by the Helmholtz equation and the solutions are based on oscillating kernels for the pressure or the velocity. For infinite domains the application of the Boundary Element Method (BEM) has some advantages, since only the surface has to be discretized. This fact can be even enhanced by utilizing isogeometric elements that allow an exact representation in terms of the CAD geometry.

While the geometry is described by NURBS exactly, the solution variables do not necessarily correlate to these ansatz functions. Hence, it could be advantageous to incorporate the frequency dependent characteristics directly into the ansatz functions. Different possibilities exist for this problem, as Plane Wave Approximations or other oscillatory approximations. The aim is to solve the equation with all its characteristics, but using a smaller number of unknowns than in the conventional procedures.

In this contribution the workflow of a BEM with exact geometries by NURBS and different ansatz functions for the field variables is described. The conventional concepts for a better solution quality, as h-, p- or k-refinement are compared to the oscillatory ansatz functions. The frequency dependent behavior of the Helmholtz equation solution is analyzed in terms of the different methods and special care is taken onto the numerical integration.

REFERENCES

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