Isogeometric analysis of acoustic scattering

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ABSTRACT

Acoustic scattering has been thoroughly analyzed with the use of finite element analysis (FEA)[2]. The problem at hand is a coupled acoustic-structure interaction problem on an unbounded domain. An object of elastic material (modelled by linear elasticity equations) is surrounded by a fluid. Using some physical assumptions, the fluid is described by the wave equation which is transformed to the Helmholtz equation. As the domain is unbounded, one must create an artificial boundary in order to use FEA. Several methods exist for handling the boundary conditions at this artificial boundary. The present work has focused on the infinite element method (IEM) and boundary element method (BEM).

The elastic object is typically exactly represented by NURBS, and is thus especially suited for isogeometric analysis (IGA)[1]. Moreover, it will be shown that the k-refinement property of IGA introduces even further accuracy. Comparisons between FEM and IGA will be shown both for BEM and IEM. For the scattering problem on a spherical shell, the existence of the exact solution enables the comparison in the energy norm. Our results indicate that the accuracy improvement offered by IGA mainly comes from the k-refinement property when comparing with hp-FEM.

REFERENCES

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