Isogeometric methods for acoustic-structure interactions (ASI)

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ABSTRACT

The problem at hand is a coupled acoustic-structure interaction (ASI) on an unbounded domain. An object of elastic material is surrounded by fluid. Using physical assumptions, the fluid is described by the wave equation, which is transformed to the Helmholtz equation. That is, we consider the frequency domain instead of the time domain.

Both the infinite element method (IEM) [1] and the boundary element method (BEM) have been investigated on the acoustic scattering problem using the isogeometric method [2]. As the computer aided design (CAD) files typically parameterizes the boundary of the scatterer, the IGABEM represents the ideal bridge between design and analysis. The BEM method result in a dense matrix, which is computationally expensive to build. The infinite element method resolves this issue, but introduces a volume domain to be discretised, which weakens the bridge between CAD and IGA. When combining IGA with these methods we again observe significant improvements over classical FEA.

In the presentation, we will compare our numerical results with exact solutions to the problem of acoustic-structure interaction by elastic spherical symmetric scatterers consisting of many fluid and solid layers [3].

REFERENCES

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[3] J. V. Venås and T. Jenserud, "Exact 3D scattering solutions for spherical symmetric scatterers", *Journal of Sound and Vibration*, Submitted 2017.