Error Evaluations of the Isogeometric Indirect Boundary Element Method for Industrial Acoustic Applications

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ABSTRACT

Recently, an IGA approach was developed for acoustic simulations by using the Indirect Variational BEM (iBEM) formulation [1]. As compared to the direct BEM, iBEM has the advantage of being able to tackle combined interior/exterior problems, as well as applications containing open boundary surfaces. As such, it is much more suited for general industrial problems. It also leads to symmetric matrices, which reduces the computational cost for larger problems. The isogeometric indirect boundary element method (IGiBEM) can handle multiple patches by enforcing C^0 continuity across patches through the use of a master-slave coupling approach[2] and can avoid hypersingular integral terms by applying regularizing coordinate transformations to contributions from both intra- and inter-element interactions. In this study, IGiBEM is applied to solve the steady-state acoustic problem on a loudspeaker case and an in-depth error evaluations is carried out by comparing it to conventional iBEM. The different sources of errors, i.e. discretization error, quadrature error and geometrical error, are examined for both methods. The focus is put on geometrical error and the importance of using the exact geometry for a typical industrial case is demonstrated.

REFERENCES

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[2] Coox, L., Greco, F., Atak, O., Vandepitte, D., & Desmet, W., A robust patch coupling method for NURBS-based isogeometric analysis of non-conforming multipatch surfaces, *Comput. Methods Appl. Mech. Engrg.*, (2017), **316**: 235-260.