Multi-region Isogeometric Analysis using Boundary Integral Equation

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Abstract

Isogeometric analysis (IGA) introduced by Hughes [1] has shown potentials to fill out the gap between CAD and CAE industries. Using the same NURBS basis function to construct the geometry and the solution space, plenty of isogeometric studies have been conducted by many researchers. One of the issues that isogeometric analysis are facing is the interface treatment between two different CAD geometric patches, which can be modelled by conforming interface or non-conforming interface. Different to the geometric modelling, the interfacewise continuity enforcement is essential part of isogeometric analysis. To deal with this multiregion continuity in IGA, several methods have been developed such as direct master slave match, Lagrange multiplier and Nitsche based approach.

CAD models are sometimes are given as only boundary information rather than NURB surface. Thus the IGA using boundary integral approach [2][3] that models only the geometric boundary is more appropriate in that case. In this study, a noble isogeometric approach for multi-region domain using boundary integral equation is proposed as an extension of finite element(FE)-based isogeometric approach for multi-patch region. The multi-region interface is modelled by a direct relationship of control points initially and other possible alternatives, Lagrange multiplier and Nitsche based approach are considered for the comparison. The developed approach is verified using the simple numerical example for the heat conduction problem having multi-region interface.

References

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