Point-wise Discretization Errors in Boundary Element Method for Elasticity Problem

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Abstract

In engineering mechanics, most elasticity problems are solved using Finite Element Methods. Applications of interval methods in Finite Element Method have been explored to treat systems with uncertainty in material parameters and uncertainty in loading. The impact of truncation error on the solutions has also been studied. Boundary Element Method is an alternative method for obtaining numerical solutions to partial differential equations, which uses Green's functions in order to reduce the dimension of the approximation by transforming domain variables to boundary variables. Interval Boundary Element Methods have been used to account for the truncation, integration, and local discretization errors, as well as the uncertainty in boundary conditions for the Laplace problem. In this work, local discretization error is bounded via interval approach for the elasticity problem using the interval boundary element formulation. The formulation allows for computation of the worst case bounds for the boundary values. From these bounds the worst case bounds on the discretization error of any point in the domain of the boundary can be computed. Example is presented to demonstrate the effectiveness of the treatment of local discretization error in elasticity problem via interval methods.

References

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