Treatment of Nonmatching Meshes Using the Scaled Boundary Finite Element Method

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Abstract

In the finite element analysis of contact problems and domain decomposition, the meshes of contacting bodies or subdomains are generally nonmatching at their interface. The treatment of the nonmatching meshes is critical to the accuracy and efficiency of the analysis.

In this presentation, the scaled boundary finite element method is applied as polyhedral elements to convert nonmatching meshes into matching ones. The nonmatching surface meshes at the interface of solid meshes are merged by intersecting the surface elements to create a new surface mesh. A node shifting procedure is developed to avoid distorted surface elements. The solid elements connected to the interface are replaced by polyhedral elements with the newly created surface mesh replacing the non-matching ones. Since the proposed procedure is based on the scaled boundary finite element method, no volume discretization, special shape functions and interface constrains are required. High-order elements can also be applied.

Numerical examples are presented to illustrate the applications and features of the proposed approach in domain decomposition, contact mechanics and modelling of fibre-reinforced materials.

Keywords: Scaled boundary finite element method, nonmatching mesh, contact mechanics, mesh generation

References

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