MODELLING THE THIRD KIND BOUNDARY CONDITION IN SCALED BOUNDARY FINITE ELEMENT METHOD BASED NUMERICAL ANALYSIS

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The third kind boundary condition usually gives relationships between functions and their derivatives along the boundary, and often appears in modelling interactions between two structures, for instance, the interaction between surrounding rock and tunnel, the interaction between buildings and foundation, and the interaction between tunnel segments and so on. In the modelling process, the impact of one structure on another is described by the third kind boundary condition.
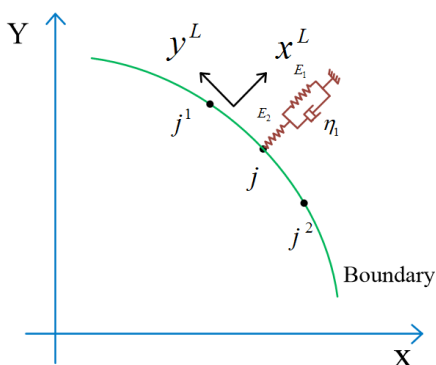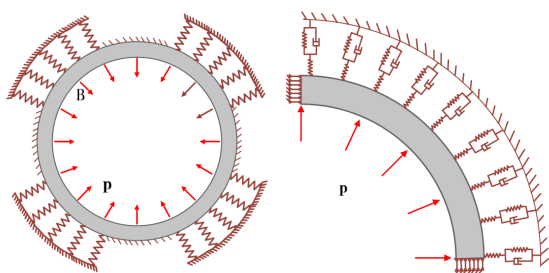
Numerical algorithms to deal with the third kind boundary condition (TKBC) are presented under the framework of Scaled Boundary Finite Element Method (SBFEM) By smoothing the bilinear TKBC, a differentiable relationship is derived, and a gradient based numerical algorithm is proposed in the solution process. For viscoelastic TKBC, a recursive constitutive equation is derived, and a temporally-piecewised algorithm is developed. In addition, a proof that the appended stiffness matrix is block-circulant is presented when the TKBC are cyclic symmetric, resulting in a reduction of computational expense of SBFEM based numerical analysis. Numerical examples are given to verify proposed approaches, and satisfactory results are obtained.

Guests are welcome!

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