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Dynamics of contact problem by adaptive simplex-shaped space-time approximation. (English) Zbl 0668.73077

J. Méc. Théor. Appl. 7, Suppl. 1, 235-248 (1988).

The variation of the stress field occurring in times are the characteristic feature of the dynamic problems. The non-classical problems such as problems of contact involve changes in properties of structure, especially wave reflection zones or dissipative zones. Stress field propagation requires variable meshes that can allow to approach the phenomenon with the smallest error in each time step. The space-time approximation of the differential equation of motion allows to modify the spatial partition into finite elements in a continuous way. Applying the simplex-shaped space-time elements one can gain the triangular form of coefficient matrix directly in the element matrix assembly process. Consistent characteristic matrices are used. The presented approach was successfully applied to plane strain analysis with frictional unilateral conditions. The method is more powerful for materially nonlinear cases for which element matrices should be calculated in each time step. Good accuracy of the movable mesh approach was proved in several testing examples.

MSC:

74A55 Theories of friction (tribology)
74M15 Contact in solid mechanics
74S05 Finite element methods applied to problems in solid mechanics

Keywords:

wave reflection zones; dissipative zones; space-time approximation; differential equation of motion; simplex-shaped space-time elements; triangular form of coefficient matrix; Consistent characteristic matrices; frictional unilateral conditions