FINITE ELEMENT CONTACT-IMPACT PERFORMANCE ANALYSIS WITH SHELL STRUCTURES

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A continuum-based four-node shell element, under the Belytschko's element family approach, has been studied within the framework of nonlinear transient analysis. Successive improvements for one point quadrature shell element [1,2,3] have been introduced in order to achieve robustness and low computational cost to handle both geometric and physical nonlinearities in transient problems. A co-rotational formulation for the kinematic description is used allowing large displacements, rotations and nonlinear material behavior [4]. The transverse shear stresses are computed accounting a linear elastic law, based on Reissner-Mindlin assumption. Special projection operators deal with rigid body rotations, drilling degrees of freedom under arbitrary displacements field, bending forces and transverse shear [1,2,3]. Stability is achieved by a perturbed hourglass control. The code for the implemented element was conceived under a parallel/vector process with good results obtained towards these strategies [5]. Contact-Impact conditions (impenetrability of bodies) are approximately enforced by penalty traction applied to the boundaries using Splitting Pinball Technique [6,7]. In our implementation we have used a simple and efficient technique, suitable to handling contact between shell elements, namely the Splitting Pinball Technique [7]. It is a variation for shell structures derived from the original Pinball Algorithm . The code for the implemented element was conceived under a parallel/vector process and good performance results are obtained towards these strategies.

References

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