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Abstract

Challenging problems of computational mechanics may often be characterised by large deformations that are common in manufacturing processes such as forging. The finite element method faces difficulties in simulating large deformations, due to severe mesh distortion. A solution to overcome these difficulties is to use meshless methods like Smoothed Particle Hydrodynamics (SPH). This paper presents a thermomechanical SPH in total Lagrangian formulation to simulate efficiently large deformations thermomechanical problems. The continuum is modelled as a Hamiltonian system of particles (energy-based framework) when dissipative effects are considered where the constitutive equation is represented via an internal energy term. A comparison with an Eulerian SPH formulation and FEM is presented to assess the accuracy of the total Lagrangian formulation trough examples of high velocity Taylor impact test and hot forging test.

Keywords

SPH, Eulerian, total Lagrangian, thermomechanical, large deformations, Abaqus.