AN IMPLICIT MATERIAL POINT METHOD: FORMULATION AND VALIDATION

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ABSTRACT

The main objective of this work lies in the development of a numerical technique which allows to solve problems where large displacement and large deformation of the continuum are involved. The Material Point Method (MPM) has been identified as a suitable numerical method to achieve such objective. MPM uses particles that carry their own mass and velocity and internal state variable and solves the governing equations in a FEM-like manner on a background mesh. It uses a Lagrangian description to track with more accuracy the deformation of the continuum avoiding the element distortion, typical drawback of other Lagrangian techniques which requires a frequent remeshing. MPM naturally respects mass and momentum balance, an important feature which makes it really useful in several engineering applications.
In the present work an implicit Material Point Method implemented in Kratos Multiphysics is presented. The code is validated by means of several Solid Mechanics benchmarks in static and dynamic regime. The formulation and results of code validation are illustrated.