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APPLICATIONS OF THE MATERIAL POINT METHOD IN ENGINEERING

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ABSTRACT

The Material Point Method (MPM) is a numerical technique which combines advantageous features of both Lagrangian and Eulerian formulations while avoiding some of the classical shortcomings.

Classical MPM formulations simulate the continuum as a set of Lagrangian material points moving on a fixed background grid. The material points carry all physical properties of the continuum such as mass, momentum, material parameters, strains, stresses as well as external loads, whereas the Eulerian mesh, where governing equations are solved, stores no permanent information. The dual discretization of the domain makes the method suited to simulate large displacements without mesh tangling.

MPM was initially developed for fluids and later it was extended to solids. Theoretical improvements and variations with respect to the classical formulation have been recently developed and the applications of MPM cover a wide range of engineering problem including cracks, saturated and unsaturated porous media, erosion and fluid-solid interactions among others.

The principal aim of this invited session is to present recent advances in the MPM and its application to engineering problems. Innovative MPM formulations and particles techniques based on MPM are welcome, as well as application of MPM to civil, mechanical, aeronautical, biomedical engineering and other applied sciences.