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ADVANCES IN THE MATERIAL POINT METHOD FOR SOLID MECHANICS

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ABSTRACT

In recent years, a large number of alternatives to standard finite element methods have been proposed for the solution of engineering problems in solid mechanics, particularly those involving very large deformations, a challenge to any Lagrangian mesh-based method due to mesh distortion, and the computational expense of remeshing during a simulation. An exciting alternative to the options discussed above is the material point method (MPM). In the MPM, discretisation occurs via mesh-free material points that move freely through the problem domain relative to a background mesh.

This method is, to date, an underexploited method for which the first description was given in explicit form in the mid-1990s [1], with an implicit version, close to the conventional FE method, appearing in 2003 [2].

There is now increasing interest in the MPM as a means of modelling 2D and 3D solid mechanics problems in which very large deformations occur, e.g. in the study of landslides and metal forming. The purpose of this minisymposium is to highlight this method to those unfamiliar with it. It is also intended as a forum for presenting advances in the method, e.g. dealing with numerical issues, modelling of coupled problems, computational efficiency and application to real world problems.

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