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A New Combined Scheme of Discrete Element Method and Meshless Method for Numerical Simulation of Impact Problems

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Summary

In the present paper, a combined scheme of discrete element method (DEM) and meshless method for numerical simulation of impact problems is proposed. Based on the basic principle of continuum mechanics, an axisymmetric DEM framework is estabilished for modeling the elastoplastic behavior of solid materials. A failure criterion is introduced to model the transformation from a continuum to a discontinuum. The friction force between contact elements is also considered after the failure appears. So our scheme can calculate not only the behavior of continuum and discontinuum, but also the transformation process from continuum to discontinuum. In addition, a meshless interpolation method is adopted to calculate the strain tensor, which is a non-local data fitting algorithm. Numerical simulations are carried out to validate our scheme. The numerical results agree well with those obtained by the finite element method (FEM) and the corresponding experiment respectively, which proves the feasibility and reliability of our computational scheme for analyzing the impact problems.