Material point method simulation of dense granular material
DUAN ZHANG, XIA MA, Los Alamos National Laboratory — Accurate modeling and simulation of granular flow or deformation require a numerical method with Lagrangian description to account for history dependence of the material. However, large deformation or flow of the material requires an Eulerian description. Numerically, different descriptions of the material result in different codes and applications. Unsatisfactory results have been reported by many modelers using both methods. For instance, element deletion scheme is used in the finite element method, a Lagrangian description, to eliminate the highly distorted elements, which results in artificial reduction of inertia from the problem. In codes using the finite volume method, an Eulerian descriptions, how to advect brittle damage of the material is a significant issue. To address these issues we use the material point method, which uses Lagrangian material points and Eulerian mesh simultaneously. Improvements are made to the original material point method for our applications. It is found that the improvements are critically important to granular flows results from brittle damage of the material, while it is marginally important to ductile materials.

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