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3D point-blast geometrical shock dynamics with moving least squares surface reconstruction for point sets[1] HENG LIU, VERONICA ELIASSON, Univ. of California, San Diego — Blast wave focusing can lead to extreme thermodynamic conditions and has been applied to a variety of fields such as medical treatment and civil engineering. Considering all difficulties and constraints to conduct full-filed multi-blast explosion experiments, oftentimes numerical simulation becomes the first option. As solving the inviscid Euler equations can be computationally expensive, Geometrical Shock Dynamics (GSD) is applied in this study to help reduce the computational cost. Whitham's original GSD method is proved to yield accurate results in the case of uniform flow states behind the shock front, but is inadequate if the non-uniformity exits such as in a blast wave. Some approaches have been proposed to address this issue, one of which is to apply the existing numerical data to account for the post-blast flow effect. Bach and Lee's analytical solution to point-blast is manipulated to drive the blast propagation in a modified GSD model, PGSD, and its extension to 3D only needs slight changes. As PGSD makes use of curvature-Mach relation instead of area-Mach relation as in GSD, triangulated meshes and connectivity information are not needed to compute surface patch areas. 3D surface shape is represented by point sets, from which Moving Least Squares (MLS) surface reconstruction is computed. MLS surface is capable of selectively keeping the local surface feature and projecting any point onto it that delivers convenience to mesh regularization.

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