Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Detonation Shock Dynamics Modelling with Arbitrary Boundaries ALEXANDER HODGSON, AWE Plc — The Detonation Shock Dynamics (DSD) model can be used to predict detonation wave propagation in a high explosive (HE). The detonation wave is prescribed a velocity that depends on its curvature. Additionally, the angle between the wave and the HE boundary may not exceed a specified "boundary angle", the value of which depends on the HE and its confining material(s). The level-set method is commonly used to drive DSD computation. Boundary conditions are applied to the level-set field at the charge edges to maintain the explosive boundary angle criteria. The position of the boundary must be accurate and continuous across adjacent cells to achieve accurate and robust results. This is mainly an issue for mixed material meshes where the boundary does not coincide with the cell boundaries. For such meshes, a set of volume fractions defines the amount of material in each cell. The boundary is defined implicitly by the volume fractions, and must be reconstructed to an explicit form for use in DSD. This work describes a novel synthesis of the level-set method and simulated annealing, an optimisation method used to reconstruct the boundary. The accuracy and robustness of the resulting DSD calculation are evaluated with a range of test problems.

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Date submitted: 23 Feb 2017 Electronic form version 1.4