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Staggered Mesh Godunov (SMG) Schemes for Lagrangian Hydrodynamics GABI LUTTWAK, Rafael, Box2250, Haifa 31021, Israel, JOSEPH FALCOVITZ, Institute of Mathematics, Hebrew University of Jerusalem, Israel — Second order Godunov schemes[1] are recognized as the state of the art for Eulerian calculations.The difficulties inherent in modifying the zone-centered Godunov method into a 3D Lagrangian/ALE scheme have lead us to formulate a SMG scheme [2]. Here, we propose to bridge the Lagrange to Godunov "conceptual gap" comparing three SMG versions. The first two employ total energy equation. In the first one we solve face-centered RP (Riemann Problems) for the energy and zone-centered RP for the momentum. The second one [2] uses only face-centered RP. The third one, with internal energy, uses only cell-centered "collision RP" and is similar to Christensen's [3] split-Q scheme. In 1D,it is equivalent to a pseudo-viscosity which consists of linear and quadratic terms in the velocity gradient. The linear term requires second-order accuracy aimed at suppressing Q-heating in regions of smooth flow. This capability relies on a judiciously monotonized piecewise-linear approximation of velocities in zones. A 1D "shockless" compression problem was devised as a Q heating test case. A 3D implementation is also presented. [1] Ben Artzi M., Falcovitz J., "Generalized Riemann problems in computational fluid dynamics," Cambridge Univ. Press, London, 2003. [2] Luttwak G., p255-258, Shock Compression of Condensed Matter-2001, ed. by Furnish M.D. et al., A.I.P. 2002 [3] Christensen R. B.,UCRL-JC-105269 (1990).

Gabi Luttwak
Rafael, Box2250, Haifa 31021, Israel

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