

REDUCTION OF MATERIAL DIFFUSION IN MULTI-MATERIAL ALE REMAP: CONSERVATIVE AND BOUNDED MATRIX-FREE METHOD

TZANIO V. KOLEV, ROBERT N. RIEBEN, VLADIMIR Z. TOMOV, AND ARTURO VARGAS

ABSTRACT. We propose a new method for remap of material volume fractions, densities, and specific internal energies in the context of multi-material compressible ALE hydrodynamics [?]. The remap is based on advection in pseudotime. As the volume fraction approach may diffuse materials over many mesh elements, we introduce a sharpening modification on PDE level. We explain the effects of the modification and how it produces results that are still conservative for volume, mass, internal energy, and bounded with respect to the volume fraction, density, and specific internal energy. The latter involves FCT-type methods. The second major contribution, in addition to sharpening, is that all remap methods avoid assembly of global matrices. This avoids data motion and enables higher computational efficiency [?, ?].

Keywords: advection remap, volume fractions, material diffusion, bounds preservation, matrix-free

Mathematics Subject Classifications (2010): 65M60, 76N15, 76L05

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LAWRENCE LIVERMORE NATIONAL LABORATORY
Email address: kolev1@llnl.gov

LAWRENCE LIVERMORE NATIONAL LABORATORY
Email address: rieben1@llnl.gov

LAWRENCE LIVERMORE NATIONAL LABORATORY
Email address: tomov2@llnl.gov

LAWRENCE LIVERMORE NATIONAL LABORATORY
Email address: vargas45@llnl.gov