

Abstract Submitted
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Marker Re-Distancing and Sharp Reconstruction for High-Order Multi-Material Interface Evolution¹ ROBERT NOURGALIEV, PATRICK GREENE, SAM SCHOFIELD, Lawrence Livermore National Laboratory — A new method for high-order front evolution on arbitrary meshes is introduced. The method is a hybrid of a Lagrangian marker tracking with a Discontinuous Galerkin projection based level set re-distancing. This Marker-Re-Distancing (MRD) method is designed to work accurately and robustly on unstructured, generally highly distorted meshes, necessitated by applications within ALE-based hydro-codes. Since no PDE is solved for re-distancing, the method does not have stability time step restrictions, which is particularly useful in combination with AMR, used here to efficiently resolve fine interface features. A high-order (implemented up to the 6th-order) level set approach is utilized for a new sharp treatment of mix elements, which reconstructs multiple-per-element solution fields (one for each material present in the mix element). Reconstruction incorporates interfacial jump conditions, which are enforced in the least-squares sense at the interfacial marker positions provided by MRD. Since no explicit differentiation across the interface is involved in the assembly of residuals for mass, momentum and energy equations, the method is capable of capturing discontinuous solutions at multi-material interfaces with high order, and without Gibbs oscillations.

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