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A Quadrature Free Discontinuous Galerkin Conservative Level Set Scheme MARK CZAJKOWSKI, OLIVIER DESJARDINS, University of Colorado at Boulder — In an effort to improve the scalability and accuracy of the Accurate Conservative Level Set (ACLS) scheme [Desjardins et al., J COMPUT PHYS 227 (2008)], a scheme based on the quadrature free discontinuous Galerkin (DG) methodology has been developed. ACLS relies on a hyperbolic tangent level set function that is transported and reinitialized using conservative schemes in order to alleviate mass conservation issues known to plague level set methods. DG allows for an arbitrarily high order representation of the interface by using a basis of high order polynomials while only using data from the faces of neighboring cells. The small stencil allows DG to have excellent parallel scalability. The diffusion term present in the conservative reinitialization equation is handled using local DG method [Cockburn et al., SIAM J NUMER ANAL 39, (2001)] while the normals are computed from a limited form of the level set function in order to avoid spurious oscillations. The resulting scheme is shown to be both robust, accurate, and highly scalable, making it a method of choice for large-scale simulations of multiphase flows with complex interfacial topology.

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