Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Generalization of the Volume-of-Fluid method with realizable and planarity preserving transport of geometric moments VINCENT LE CHENADEC, Ecole Centrale Paris - Laboratoire EM2C - UPR CNRS 288 — In two-phase flow applications, Volume-of-Fluid methods rely on a local reconstruction of the interface, performed either by approximating the interface normal based on the neighboring volume fraction values, or by designing error estimates quantifying the deviation between the exact and the reconstructed interfaces. Such estimates may be either non-local, in which case they involve neighboring volume fraction values, or local, in which case additional geometric information is required (centers of mass of each fluid, matrices of inertia,...). The latter approach presents obvious advantages in terms of computational overhead and accuracy. Transport equations for these high-order geometric moments exist, but their discretization represents a challenge, in particular when it comes to planarity preservation and realizability. In this work, we propose a geometric discretization which guarantees these properties for arbitrary moments, and its application to the first-order generalization of the Volume-of-Fluid method (Moment-of-Fluid). Within this framework, the emphasis is then set on the reconstruction, and particularly on the solution of the underlying non-linear constrained minimization. Finally, transport and reconstruction algorithms are tested in standard 2D and 3D cases.

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Date submitted: 02 Aug 2013 Electronic form version 1.4