Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

A GPU-accelerated interfacial flow solver with advected normals: Application to contact line problems ASHISH PATHAK, MEHDI RAESSI, University of Massachusetts Dartmouth — Accurate curvatures are essential for modeling surface tension forces in interfacial flows. The advected normals method by Raessi *et al.* yields curvatures that converge with mesh refinement. The same level of accuracy cannot be achieved with traditional approaches to calculating curvature, in which the gradient of the volume-of-fluid (VOF) or level-set functions are used. The flow solver used here is based on the VOF method and uses the two-step projection with GPU acceleration. In addition to curvature calculation, the advected normals are used for reconstructing the interface. The method has been successfully applied before to two-dimensional flow problems. We present here its extension to three dimensions. The PDE based extension of the vectors around the interface which was slow and computationally intensive in the original form has been accelerated by developing a GPU version of the extension algorithm. The advected normals method was also extended to handle contact line problems. The method has an advantage over traditional approaches to imposing contact angle. Since the normal vectors "communicate" with each other in this method, the effect of imposed contact angle is "felt" by the normal vectors in a wider region and is independent of grid resolution.

Ashish Pathak
University of Massachusetts Dartmouth

Date submitted: 30 Jul 2012 Electronic form version 1.4