Accepted Manuscript

Sharp interface models for two-phase flows: Insights towards new approaches

Hanif Montazeri, Seyed Hadi Zandavi, Aimy Bazylak

PII: S0045-7825(17)30255-4
DOI: http://dx.doi.org/10.1016/j.cma.2017.04.022
Reference: CMA 11424

To appear in: *Comput. Methods Appl. Mech. Engrg.*

Received date : 7 February 2017
Revised date : 20 April 2017
Accepted date : 21 April 2017

Please cite this article as: H. Montazeri, et al., Sharp interface models for two-phase flows: Insights towards new approaches, *Comput. Methods Appl. Mech. Engrg.* (2017), http://dx.doi.org/10.1016/j.cma.2017.04.022

Sharp interface models for two-phase flows: insights towards new approaches

Hanif Montazeri[1,2,*], Seyed Hadi Zandavi[2], and Aimy Bazylak[1]

[*]Corresponding author: *hanif@nuphysics.ca*

[1]Department of Mechanical & Industrial Engineering
University of Toronto, 5 King's College Road, Toronto, ON M5S 3G8, Canada

[2]NuPhysics Consulting Ltd., Canada
112 College Street, Toronto, ON M5G 1L6, Canada

Abstract

A detailed evaluation of two class of sharp methods for implementing interfacial forces is presented. These methods are implemented in a state-of-the-art numerical algorithm for two-phase flows. Each method has respective advantages and disadvantages; however, none of the existing sharp methods can be readily employed due to issues such as numerical instability or non-physicality. These issues and the reasons for their occurrence are comprehensively discussed through several test cases. Using the insights gained from this detailed evaluation, an alternative method for sharp implementation of interfacial forces is proposed. The proposed method is tested and validated for flows such as Rayleigh-Taylor instability and a falling droplet under gravity.

Keywords: Computational fluid dynamics, Sharp interfacial forces, Two-phase flow, Delta function, Stair-Step method, Areal method, Spurious velocities