On the Role of Particle and Radial Basis Functions in a Finite Element Level Set Method for Bubble Dynamics

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ABSTRACT

The aim of this presentation is to highlight the role that Particle-based simulations and Radial Basis Functions (RBFs) have played in the development of a computationally efficient, level-set, Finite Element method for the simulation of Newtonian and non-Newtonian interface flows [1].

First, we introduce the mathematical formulation and the interface-capturing technique used in the simulation of multiphase flows, underscoring the influence of marker particles on the enhanced definition of the interface. Then, we explore the effect of adding polymer particles to the domain to perform Brownian Dynamics Simulations of polymer flows [2]. Finally, we leverage RBFs to reconstruct, in an almost free-independent way the polymer stress tensor retrieved from the polymer particles [3].

Numerical simulations of pure advection flows and bubble dynamics simulations of complex flows on two-dimensional configurations emphasize the improvements offered by this hybrid, Finite Element / RBF / Particle-based method.

REFERENCES