

## STUDY AND SIMULATION OF MULTIPHASE FLOW WITH FREE SURFACE

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**ABSTRACT:** Direct numerical simulations of unsteady multiphase flow, using a VOF method for tracking free surface, are presented. The method is based on writing one set of governing equations for the whole computational domain and treating the different phases as one fluid with variable material properties (density and viscosity). The unsteady Navier–Stokes equations are solved by a conventional finite-volume method on a fixed, structured Staggered grid and the interface, or front, is tracked explicitly. Interfacial source terms such as surface tension are computed at the interface. Advection of the concentration of the fluid is done by following the upwind scheme. The method has been implemented for two-dimensional flow. First, the method is described for the flow of two immiscible fluid. Then the transport equation of the color function is treated and sharpened using a modified smoothing method, finally a five cells of curvature surface tension  $\kappa$  is computed by a continuum surface force method (CSF), and added as source term to the momentum equation. A homemade C++ code is elaborated.

**KEYWORDS:** *Multiphase flow, volume of fluid, free surface, surface tension, finite volume*

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