

This paper discusses the application of the extended finite element method (XFEM) to solve two-phase incompressible flows. The Navier–Stokes equations are discretised using the Taylor–Hood finite element. To capture the different discontinuities across the interface, kink or jump enrichments are used for the velocity and/or pressure fields. However, these enrichments may lead to an inappropriate combination of interpolations. Different polynomial enrichment orders and different enrichment functions are investigated; only the stable combination will be used afterward.

In cases with a surface tension force, the accuracy mainly relies on the precise computation of the normal and curvature. A novel method for computing normal vectors to the interface is proposed. This method employs successive mesh refinements inside the cut elements. Comparisons with analytical and numerical solutions demonstrate that the method is effective. Moreover, the mesh refinement improves the sub-integration in the XFEM and allows for a precise re-initialisation procedure.