An adaptive space-time algorithm for a two-phase incompressible immiscible flow

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ABSTRACT

An adaptive method is proposed for a two-phase incompressible immiscible flow. The time-dependent Navier-Stokes equations with variable density and viscosity are coupled to a transport equation for the phase. Continuous, piecewise linear finite elements with large aspect ratio are used for the space discretization, order two finite differences are used for the time discretization.

A posteriori error estimates in space and time are derived. An adaptive algorithm is presented, with goal to maintain both errors due to space and time close to a given preset tolerance.

Numerical results are presented, first on an academic test case, which allows the effectivity index to be investigated, then on more complex situations, such as Rayleigh-Taylor instabilities.