Relaxation method based solvers for multifluid flows

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ABSTRACT

We are concerned with the numerical simulation of diphasic compressible flows. The two phases are assumed non-miscible and separated by interfaces where surface tension forces are developed. In this context, numerical methods based on interface tracking (Front tracking) or reconstruction (VOF, MOF) can be used. Unfortunately, for these approaches, interface topology changes and wave transmissions are difficult points. In the present work, we consider diffuse interface models [1,6]. For theses methods, interfaces are artificially smeared to create a mixture zone. Let us note that the physic in this artificial zone needs to be defined in order to preserve the original properties of the interfaces. For the surface tension, we use a continuum formulation. Brackbill *et al.* proposed in [3] a way to obtain this formulation by the so called CSF model.

The resulting systems are genuinely non-conservative. Our numerical schemes are based on relaxation type systems [5] which are diffusive approximations of the mathematical models. The associated Riemann problems can be solved exactly and numerical solutions are updated by classical projection methods. From a mathematical point of view, the relaxation method will be reformulated in the term of the super consistency method [7,2] and in the term of the formal extension to non-conservative systems [4].

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