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The evolution of the Rayleigh-Taylor and Richtmyer-Meshkov instabilities in a finite height domain[1] SNEZHANA I. ABARZHI, Carnegie Mellon University — We apply group theory analysis to systematically study the nonlinear evolution of the Rayleigh-Taylor (RT) and Richtmyer-Meshkov (RM) instabilities in a domain of a finite height. The fluids with similar and contrasting densities are considered in case of two-dimensional RT and RM instabilities that are driven by sustained and impulsive accelerations respectively. The flow is periodic normal to the acceleration direction and has no external sources. For the nonlinear boundary value problem a family of asymptotic solutions is found, and the properties of the family solutions as well as their stability are thoroughly analyzed. For the first time the relation is identified between the family parameter (e.g. the front curvature) and the velocity shear at the front. The growth-rate of shear-driven Kelvin-Helmholtz instability is evaluated. It is shown in the nonlinear RT and RM flows in finite height domain there is an intense motion in a vicinity of the front and there is effectively no motion away from the front. In a finite size the domain the flow is decelerating in comparison to the spatially extended case. The theory outcomes for the numerical modeling of the RT and RM instabilities and for the design of experiments are discussed.

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