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Analysis and performance of high-order finite difference shock capturing schemes for multi-fluid flow computations[1] KHOSRO SHAHBAZI, South Dakota School of Mines and Technology — Ahigh-order finite difference scheme for compressible multi-fluid and multi-phase dynamics. The scheme is applicable to a wide range compressible multiphase models including mixture theory models, capable of phase change and spontaneous cavitation modeling. The scheme overcomes the difficulty of applying the common flux-based WENO finite difference scheme to multi-fluid problems by applying the reconstruction on primitive variables and, thus avoiding the spurious oscillations inherent in the standard methods. Schemes of orders up to nine are introduced and analyzed. The proposed finite difference schemes are significantly more efficient than the available high-order finite volume schemes in both storage requirement, operation counts, and inter-processor message passing in parallel computations with efficiency gains being higher at higher orders and higher spatial dimensions. For the same level of accuracy, in three-dimensional calculations, a fourfold speedup or higher at fifth-order accuracy or higher over the finite volume scheme is expected. In computations of a two-dimensional shock bubble interaction, good agreements with experimental data are obtained and competitive performance to the high-order finite volume scheme is shown.

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