

The Effect of an Isentropic Correction on a Collocated Lagrange-Remap Scheme

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Abstract

We study an Eulerian scheme of Lagrange-Remap type, which simulates compressible multi-material fluid flows. The Lagrangian phase is based on a collocated Lagrangian scheme called EUCCLHYD (Explicit Unstructured Cell-Centered Lagrangian HYDrodynamics, [1]), whereas the remap phase uses alternate directions with interface reconstruction of PLIC type. The EUCCLHYD scheme, which is built on the resolution of acoustic Riemann problems at nodes, is totally conservative, second order in time and space, and captures shock waves accurately. However, the intrinsic entropy production turns out to be an inconvenient for isentropic flows (rarefaction/expansion waves, isentropic compression).

In [2], Braeunig expresses the isentropic production of a cell as its contribution on the faces. This idea was used in [3] to modify the EUCCLHYD scheme in order to nullify the entropy production in expansion zones. The first results with this so-called *isentropic flux* have been presented at the Multimat conference 2017. We extend these results to a conservative version of this isentropic flux (see figure 1). Furthermore, we compare ourselves to other state of the art approaches, such as the Tadmor flux [4].

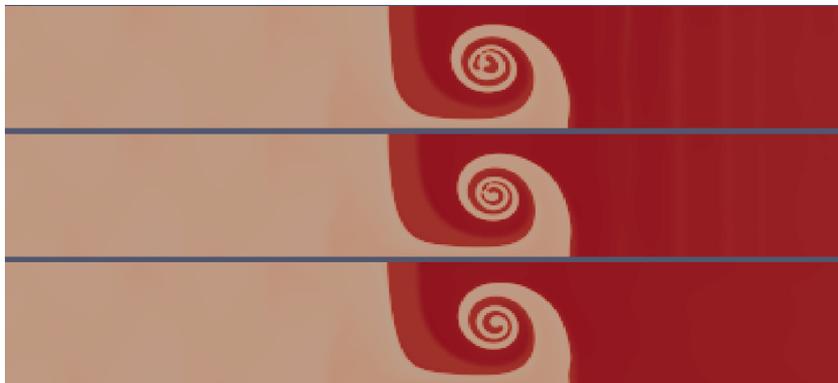


Figure 1: Density profiles Stony Brook benchmark at end time ($\approx 7 \cdot 10^{-3}$ s, 2400×60 cells). Top: isentropic flux, middle: conservative isentropic flux, bottom: EUCCLHYD.

References

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