New calculation scheme for compressible Euler equation

Takashi Nakazawa\textsuperscript{1*} and Taku Nonomura\textsuperscript{2}

\textsuperscript{1} Osaka University, Machikaneyama, Toyonaka, Osaka, Japan, nakazawa@sigmath.es.osaka-u.ac.jp
\textsuperscript{2} Tohoku University, Aobayama Aza Aoba, Sendai, Miyagi, Japan, nonomura@tohoku.ac.jp

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F. De Vuyst (HAL Id : cel-00842234, ver. 1) suggests a new mathematical model for compressible Euler equation as follows;

\[
\frac{Da_p}{Dt} + \nabla \cdot \mathbf{u} = 0, \quad a_p = \log(\rho),
\]
\[
\frac{1}{T} \frac{D\mathbf{u}}{Dt} + \nabla a_p = 0,
\]
\[
\frac{Da_p}{Dt} + \gamma \nabla \cdot \mathbf{u} = 0, \quad a_p = \log(p).
\]

In general, compressible fluid is calculated by using finite volume method (FVM) or discontinuous Gelerkin method (DGM), to guarantee high numerical calculation accuracy. However, these discretizing schemes need high calculation cost. The above mathematical model is able to be used standard Gelerkin method with lower calculation cost than FVM and DGM. In this presentation, NACA0012 is adopted as a first trial domain, and calculation results are very similar to previous results.

REFERENCE

[1] F. De Vuyst, Numerical modeling of transport problems using freefem++ software - with examples in biology, CFD, traffic flow and energy transfer. HAL Id : cel-00842234, ver. 1