New calculation scheme for compressible Euler equation

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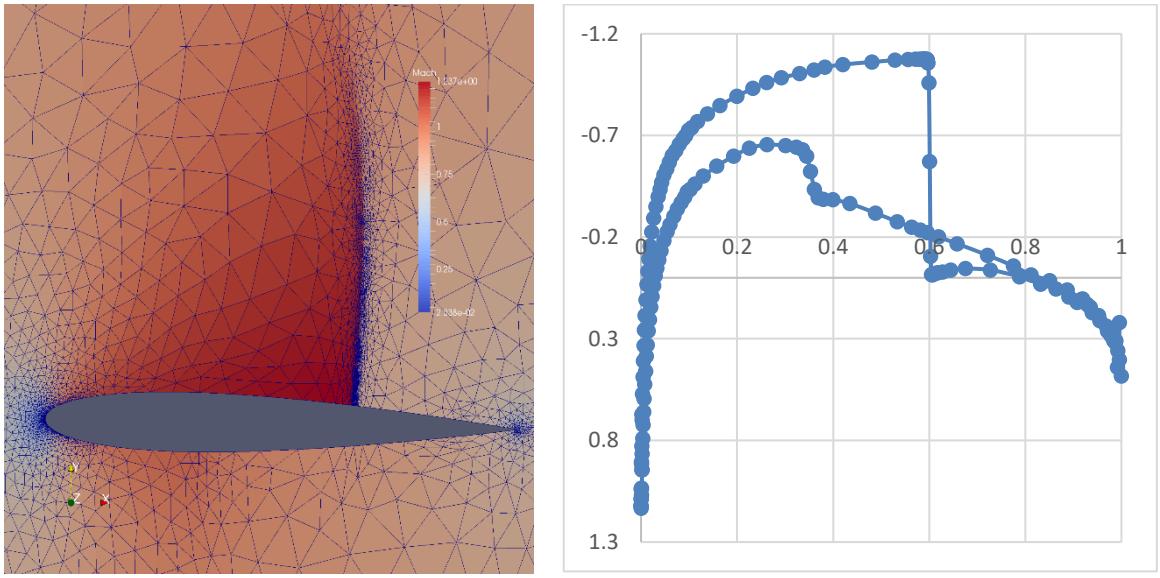
F. De Vuyst (HAL Id : cel-00842234, ver. 1) suggests a new mathematical model for compressible Euler equation as follows;

$$\frac{Da_\rho}{Dt} + \nabla \cdot \boldsymbol{u} = 0, a_\rho = \log(\rho),$$
$$\frac{1}{T}\frac{D\boldsymbol{u}}{Dt} + \nabla a_p = 0,$$
$$\frac{Da_p}{Dt} + \gamma \nabla \cdot \boldsymbol{u} = 0, a_p = \log(p).$$

In general, compressible fluid is calculated by using finite volume method (FVM) or discontinuous Gelerkin method (DGM), to gurantee high numerical calculation accuracy. However, these discritizing sheme is needed 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.



(a) Mach number and FEM mesh. (b) Pressure distribution on NACA0012.
Figure 1. Numerical simulation results.

REFERENCES

[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*