Work progress : INRIA and Université de Montpellier

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Work progress : INRIA partner

1. Bibliography on High-Order methods

A preliminary version of the review on High-Order approximation for flow problems has been written.

Any suggestion or remark is wellcome.

The pdf report(*) is available on the Norma web site (`https://imag.umontpellier.fr/~koobus/norma.html`, under the heading *Delivrables*).

(*)M. Gschwend, A. Dervieux, Higher order methods for compressible CFD. A review.

Work progress : INRIA partner

2. Advances on CENO 3D development : advection scheme

In a first study, we compare two strategies for defining the reconstruction molecule.
In the baseline CENO scheme, for each computational cell is defined a molecule related to it and more or less centered on it. We call it the *centered reconstruction approach*.
We consider also a more efficient standpoint in which the set of computational cells is partitioned in macromolecules without intersection. We call it the *partitioned reconstruction approach*.
We developed a computer program for 3D advection involving both schemes, and compared the computational cost of reconstruction and the accuracy of the solutions.
A preliminary report is on progress.
The pdf report will be soon available on the Norma web site.

Work progress : INRIA partner

3. Towards 3D flows

Matthieu Gschwend has been studying the software NiceFlow, from both standpoint of user and developer.
A version of NiceFlow is now installed and verified on his PC.
Matthieu started (with the help of a Lemma engineer) to extend to the Euler terms of NiceFlow the CENO scheme. NiceFlow involves RANS and rotating machine fonctionalities.

Work progress : Université de Montpellier partner

1. Bibliography on Immersed Boundary (IB) methods

A review on the IB approach has been written.

Any suggestion or remark is wellcome.

The pdf report(*) is available on the Norma web site (`https://imag.umontpellier.fr/~koobus/norma.html`, under the heading *Delivrables*).

(*)F. Miralles, B. Koobus, The immersed boundary approach. A review.

Work progress : Université de Montpellier partner

2. IB approach : A 2D fluid solver demonstrator

In a first study, F. Miralles is implementing a penalty-based IB method for solving the 2D compressible Navier-Stokes equations equipped with the $k - \omega$ turbulence model. The programming langage is Python. The spatial discretization is based on the SUPG-stabilized finite element method and the time-integration is performed by the Crank-Nicolson scheme. The IB method will be compared to its body-fitted counterpart for the simulation of the 2D flow past a cylinder at Reynolds number 3900.

Work progress : Université de Montpellier partner

3. Computation of the turbulent flow past a circular cylinder

S. Wornom has performed WL and ITW computations of the cylinder at Reynolds numbers 140K, 1M and 2M. In a first simulation campaign, the URANS $k-\varepsilon$ Goldberg model was mainly used on radial meshes (3 slices) with the aim of preparing the ground for three-dimensional hybrid simulations around the cylinder. The effect of the mesh resolution, WL or ITW approach, the turbulence intensity at the inlet, and the accuracy of the spatial scheme used for the turbulent variables were investigated considering the bulk coefficients and the Cp distribution. A first test was also carried out using RANS/DVMS and DDES/DVMS hybrid models at Reynolds number 1M.
In a second step, S. Wornom and F. Miralles will perform WL and ITW simulations of the flow past a circular cylinder at Reynolds numbers 1M and 2M using DDES, RANS/DVMS and DDES/DVMS hybrid approaches.