1 Software Lab: Development of the 2D Finite Volume Code

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The aim of the work is the development of a simple code based on the finite volume method for the two-dimensional case.

1.1 Work description. Steps

The flow is two dimensional in a computational box $[0, X] \times [0, Y]$. The lower surface is the wall with either slip or no-slip boundary conditions. On other boundaries put the Dirichlet boundary conditions, for instance velocity is zero and the zero gradient for pressure.

Use uniform Cartesian staggered grids. All formulas you can find in [1].

Use first only the explicit method for time derivatives.

As the initial condition take the Lamb Oseen Vortex placed at the center of the computational domain.

1.1.1 Step 1

• Use the explicit algorithm and method as in [1].

1.1.2 Step 2

• Replace the schemes for the convection term by UDS and do calculations using the explicit method.

1.1.3 Step 3

• Develop the code for the implicit method.

1.2 Report

The possible content of the report is

- Introduction. Motivation of the work, aims.
- Theoretical background. Governing equations.
- Numerical Methods.
- Results. Analysis of graphs.
- Conclusion
- References.

The report in hard copy form should be submitted at least one week before the defending.

References

[1] Kornev N. & Cherunova I. (2014). Lectures on computational fluid dynamics and heat Transfer with applications to human thermodynamics. Bookboon Publisher.