Research of Lattice Boltzmann Method

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● **Abstract**

The research objective is to implement Cumulant LBM for collision operator and validate it in terms of the solution accuracy, stability, and cost for high-Reynolds number flow. In order to compare with SRT and Cascaded LBM, numerical simulation of 2-dimensional shear layer was carried out. It is found the Cumulant LBM resolved the phenomenon better than Cascaded LBM. On the other hand, the computational cost of Cumulant LBM, w/o any tuning, was 1.2 times higher than Cascaded LBM.

● **Reasons for using JSS2**

The computational cost of unsteady flow simulation by LBM is very high.

We use JSS2 to reduce the computational time by paralleization.

● **Achievements of the Year**

Cumulant LBM was implemented to current our code and validated through the comparison with SRT and Cascaded LBM in terms of solution accuracy, stability, and cost.
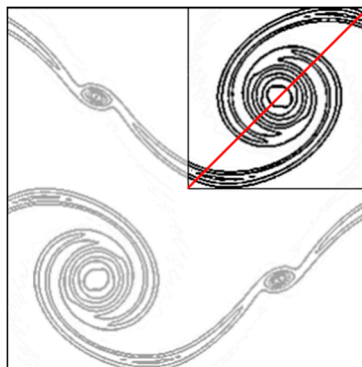

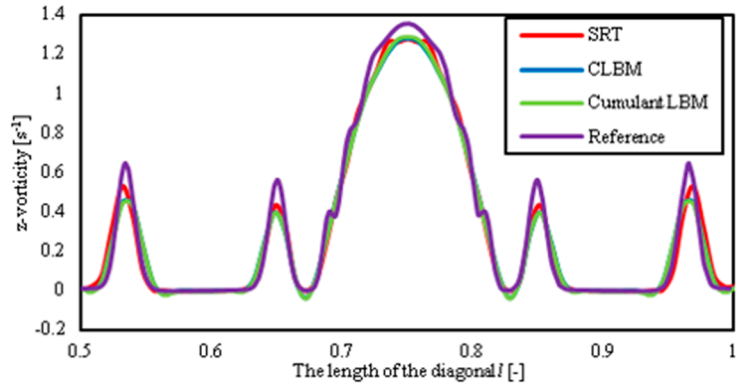Fig. 1: location where vortex profile is aquired
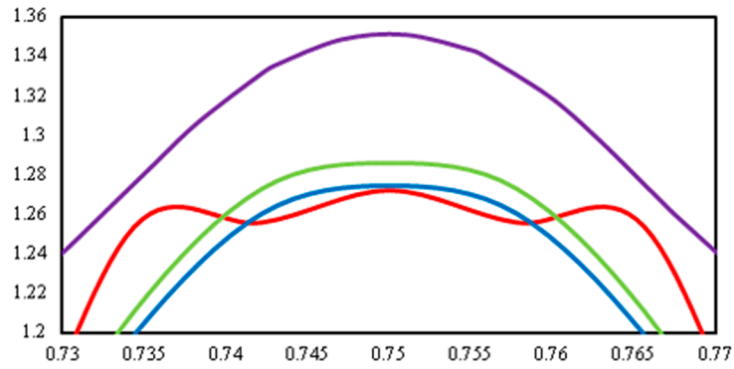
Fig. 2: profile of primary vortex

Fig. 3: profile of primary vortex (enlarge view at vortex peak)

- **Publications**

  N/A

- **Usage of JSS2**

- **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	180 Second (s)

- **Resources Used**

  Fraction of Usage in Total Resources[*1] (%): 0.04

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[2] (%)
SORA-MA	2,876.69	0.00
SORA-PP	6,295.98	0.05
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	486.37	0.50
/data	48,923.51	0.86
/ltmp	3,906.25	0.33

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	0.00	0.00

[1]: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

[2]: Fraction of Usage: Percentage of usage relative to each resource used in one year.