

Holistic approach for modeling general phenomena without relying on particular preliminary knowledge

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● Responsible Representative

Takeshi Aoyama, Aeronautical Technology Directorate, Numerical Simulation Research Unit

● Contact Information

Shogo Goto sgoto@chofu.jaxa.jp

● Members

Masashi Kanamori, Shogo Goto

● Abstract

It is important to gain a fast and accurate feedback from computational results in a design process. A traditional way of Computational Fluid Dynamics (CFD) gives physically acceptable results at the costs of tremendous amount of computational resources and time. Our research group is therefore working on a machine-learning-based approach aimed at an innovative design tool.

● Reasons for using of JSS2

A wide variety of data the amount of which should be as large as possible is required for high accuracy prediction by machine learning. This conversely indicates poorly predicted results as a consequence of a shortage of data. The combination of the processing capability of JSS2 and a fast algorithm implemented in our CFD code, FaSTAR can serve us a plenty of data within a short period of time and its data productivity is necessary for the success of our research.

● Achievements of the Year

We started our research with a learning of two-dimensional results, flowfields around a variety of objects like a circular cylinder (Fig. 1), an airfoil (Fig. 2) and so on. Then we obtained training data by processing such computational results above. Training processes were conducted on another computer with Graphic Processing Unit (GPU) since GPU is only the way to achieve a machine learning in realistic time.

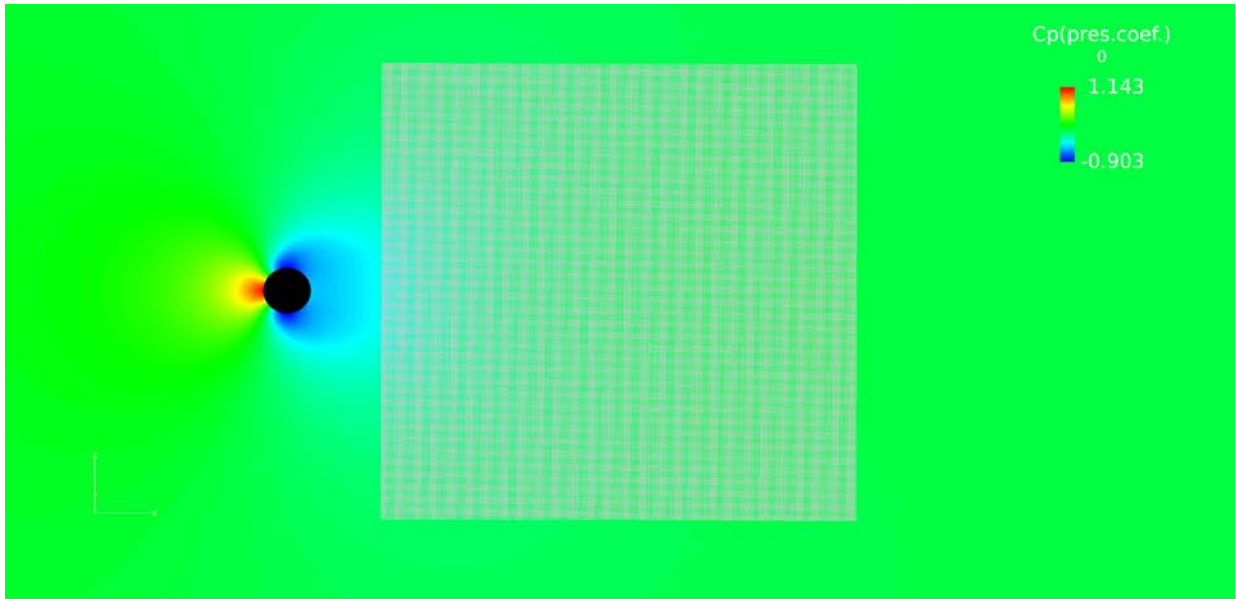


Fig.1 Flowfield around a circular cylinder(use grid part as learning data)

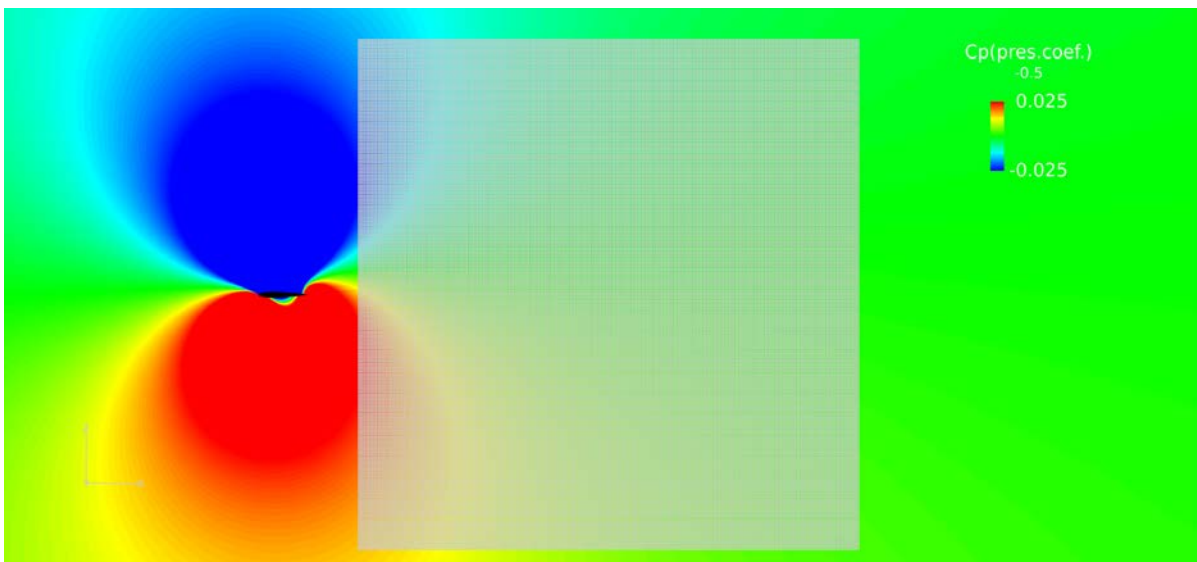


Fig.2 Flowfield around an airfoil(use grid part as learning data)

● Publications

N/A

● Usage of JSS2

● Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	2 - 64
Elapsed Time per Case	6.00 hours

● Resources Used

Fraction of Usage in Total Resources*1 (%): 0.00

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	15,513.20	0.00
SORA-PP	594.25	0.01
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	006.13	0.00
/data	6,277.90	0.12
/ltmp	1,255.58	0.09

Archiver Resources		
Archiver System 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