On development of aircraft noise control method based on resolvent analysis

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Abstract

This study aims to develop an efficient method for total temperature suppression using the resolvent analysis method, a technique for analyzing the linear response characteristics of flow. By leveraging resolvent analysis, the goal is to shorten the aircraft noise reduction process, which has traditionally required extensive trial and error.

Reasons and benefits of using JAXA Supercomputer System

In resolvent analysis, it is necessary to perform eigenvalue or singular value decomposition of extremely large matrices, on the order of 50 million by 50 million, making the use of supercomputers essential.

Achievements of the Year

Software was developed to generate the linearized Navier-Stokes operator required for executing the resolvent analysis. In addition, a program to perform the resolvent analysis was created and its functionality was verified. By utilizing the JSS3 supercomputer, it became possible to carry out resolvent analysis on large-scale data.

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	48 - 3072
Elapsed Time per Case	336 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.13

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	3,457,072.16	0.16
TOKI-ST	0.00	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2] (%)
/home	23.33	0.02
/data and /data2	4,866.67	0.02
/ssd	239.05	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2] (%)
J-SPACE	17.59	0.06

[*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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage[*2] (%)
ISV Software Licenses (Total)	0.00	0.00

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