Collaborative work for aerodynamic optimization

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● Abstract

An aerodynamic optimization tool by using the unstructured CFD code FaSTAR is developed. As a collaborative work with an airfcraft industory, an overset grid function of FaSTAR-Move, a CFD tool for moving/deforming body analysis, is applied to an optimal arrangement of slat/flap for a three-dimensional high lift device configuration.

● Reasons for using of JSS2

Aerodynamic optimization using an evolutionary algorithm requires a number of high-fidelity and large-scaled computations (3D RANS analysis) and the use of a supercomputer is necessary.

● Achievements of the Year

By setting an optimization problem for the slat arrangement of a three-dimensional high lift device configuration, an optimization calculation using the overset grid function of FSTAR-Move　together with the response surface methodology was carried out. It was confirmed that the efficiency of the aircraft configuration design process can be improved not only by the reduction of grid generation time employing overset grid system, but also by the reduction of domain partition process for parallel computations.
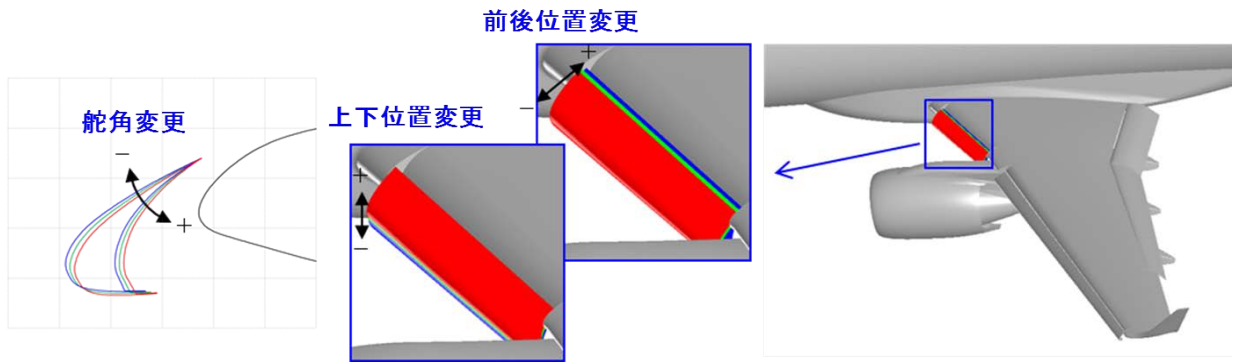
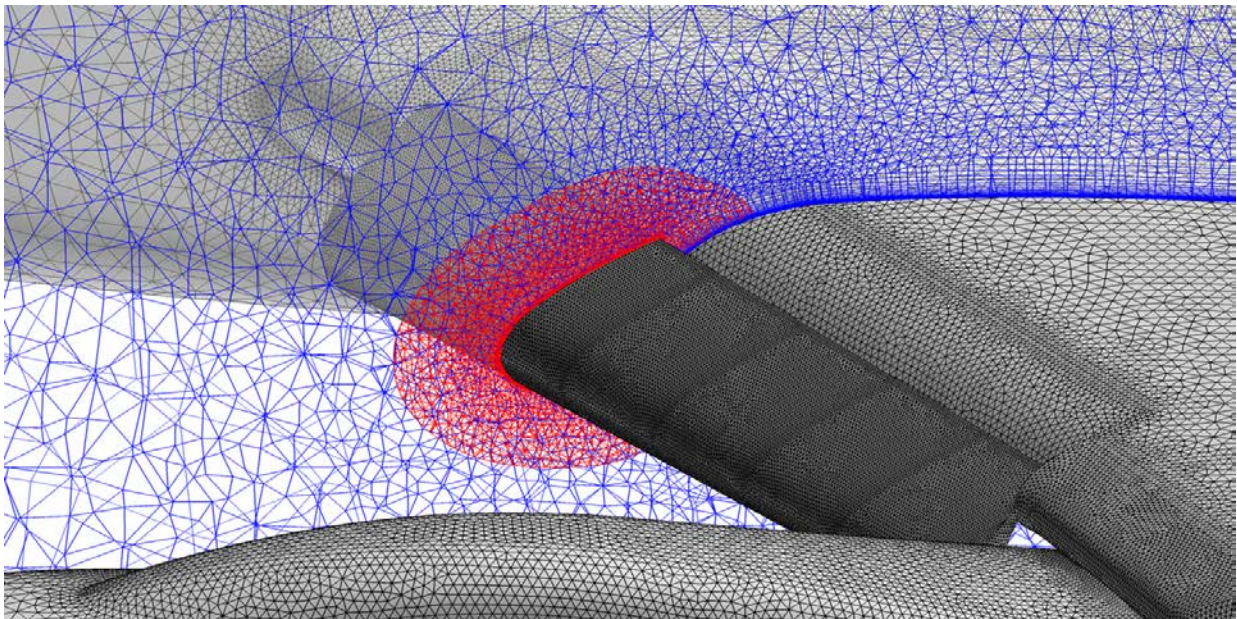Fig.1 Optimization for the slat arrangement of a three-dimensional high lift device.

Fig.2 Example of the overset grid around a slat.

Publications

N/A

🔵 Usage of JSS2

● Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	1600
Elapsed Time per Case	6.00 hours

● Resources Used

Fraction of Usage in Total Resources*1 (%): 0.01

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	15,086.58	0.00
SORA-PP	0.00	0.00
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	015.69	0.01
/data	10,503.48	0.19
/ltmp	3,210.14	0.24

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	0.26	0.01

*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