

Construction and maintenance of JIANT, a quality engineering tool for Safety&MissionAssurance platform

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● Abstract

JAXA and Kyoto University are researching with quality engineering tools (JIANT) and wallstat, a seismic simulator for wooden buildings.

Our theme is research on the combination of testing and simulation (data assimilation). This study is a joint research of JAXA-Kyoto University-Nara Women's University.

● Reasons and benefits of using JAXA Supercomputer System

The purpose of using a supercomputer is to speed up calculations.

The calculation of wallstat takes 40 minutes per case on a general PC.

That means that if we perform 6000 calculations in one case study, it takes a total of 160 days, but if we use JSS3, we can complete them in a few hours.

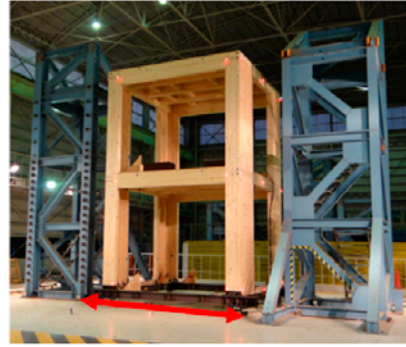
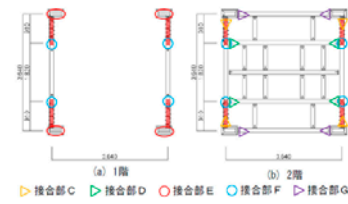
● Achievements of the Year

The test results of a two-story wooden building and the simulation were combined. Originally, the cycle and maximum value of the results did not match, but by performing a comprehensive calculation of 14641 cases, we obtained almost the same results. The calculation time in JSS3 was about 3 hours.

Since good results were obtained, we made presentations to the Architectural Institute of Japan, the Wood Society, etc.

■ 実大震動台実験

入力地震動：BSL 85%
平面：3640mm x 3640mm



- ・ 難波宗功, 中川貴文, 五十田博, 角有司: 品質工学を用いた木造住宅地震時応答解析のデータ同化 第71回日本木材学会大会 (東京大会) 2021.3.18
- ・ 小谷竜城, 中川貴文, 河合直人, 御子柴正: 木造住宅の倒壊解析手法の精度検証実験 その2 木質ラーメン架構を耐震要素とする木造躯体の振動台実験と解析, 日本建築学会大会学術講演梗概集(北海道), 構造Ⅲ, pp.189-190, 2013.8

Fig. 1: Outline of the Experiment

■ 京大生存圏研究所が開発した、木造軸組構法住宅の耐震シミュレーションツール (Wallstat) を使用

- ・ 壁・トラス
- ・ 回転ばね, 張力ばね, 等をモデル化

■ JAXAの品質工学ツール (JIANT) の利用

- ・ L121xL121=14641回の計算 (3兆回 x 3兆回 = 9桁8497兆3000京の計算と同等の網羅性)
- ・ JSS3での計算時間は約3時間



Fig. 2: Data assimilation by JSS3

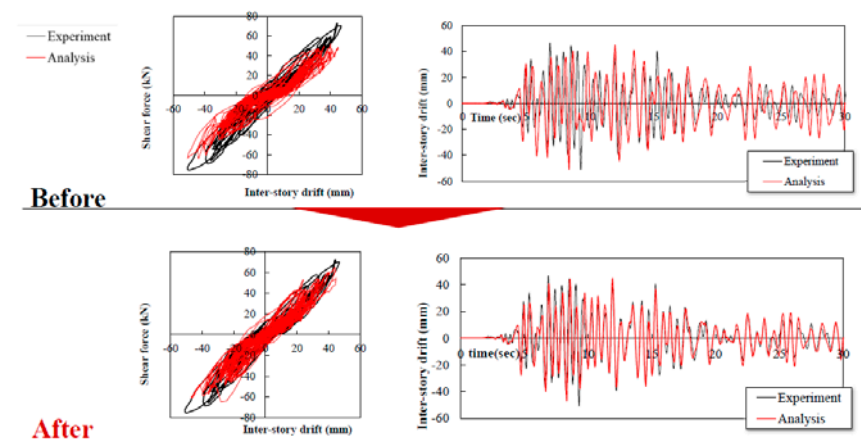


Fig. 3: Calculation Result of High-Precision Data Assimilation

● Usage of JSS

● Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	7200 Second(s)

● Resources Used(JSS2)

Fraction of Usage in Total Resources*1(%): 0.09

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	0.00	0.00
SORA-PP	98,505.68	0.77
SORA-LM	101.30	0.06
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	42.92	0.04
/data	49,257.30	0.95
/ltmp	8,789.07	0.75

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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources*1(%): 1.44

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	241.13	0.00
TOKI-RURI	2,228,628.20	12.76
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	119.21	0.08
/data	49,543.40	0.83
/ssd	715.26	0.37

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.