CALLISTO Guidance and Control Analysis

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Abstract

CALLISTO is conducting research aimed at reusing the first stage of a rocket as one way to effectively reduce the cost of transportation to space. Guidance and control technology is one of the important technologies in the series of operations from launch to landing and reuse, and the performance of the guidance and control system is evaluated through Monte Carlo simulation using a detailed mathematical model that takes into account various uncertainties. Such simulations require a high calculation load, and speeding up through parallel calculations is extremely effective.

Ref. URL: https://www.kenkai.jaxa.jp/eng/research/callisto/callisto.html

Reasons and benefits of using JAXA Supercomputer System

By using JSS's virtual desktop environment to perform Monte Carlo simulations using Matlab/Simulink, the de facto standard for guidance and control simulations, on a supercomputer, it is possible to quickly perform realistic evaluations that simulate complex systems.

Achievements of the Year

Monte Carlo simulation using Matlab/Simulink, which is the de facto standard for guidance and control simulation, is carried out on a supercomputer using JSS's virtual desktop environment to evaluate the guidance and control algorithm using a detailed model that includes vehicle characteristics and environmental conditions. We confirmed that it can be used effectively for analysis and evaluation last year. This year we have been updating the simulation code corresponding to the system design progress, preparing to apply to upcoming design evaluations.

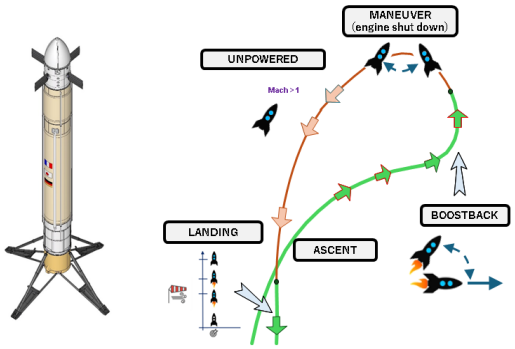

Fig. 1: CALLISTO Vehicle and Flight Profile

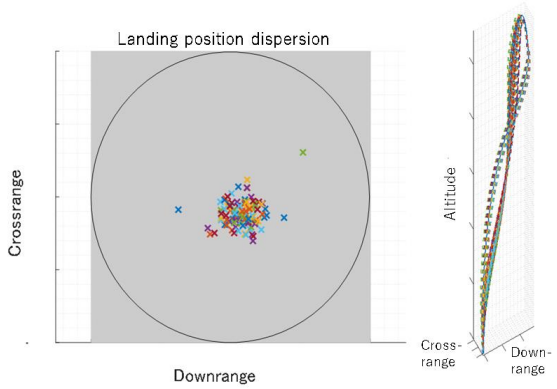

Fig. 2: Example of Monte Carlo simulation result

- **Publications**

  N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	N/A
Thread Parallelization Methods	Matlab/Simulink Parallel Computing Toolbox
Number of Processes	1
Elapsed Time per Case	1 Minute(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.03

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	300,365.40	0.31
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	245.00	0.17
/data and /data2	0.00	0.00
/ssd	0.00	0.00

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.

- **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.