

Lab4 Cuda report

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Lab1 Serial outcome:

Dissipation converged in 460838 iterations.
With max DSV = 0.085007 and min DSV = 0.082457.
Affect rate = 0.030000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 364570000.
Elapsed convergence loop time (time) : 365.
Elapsed convergence loop time (chrono) : 364742.00.

Dissipation converged in 326521 iterations.
With max DSV = 0.084885 and min DSV = 0.082338.
Affect rate = 0.040000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 280170000.
Elapsed convergence loop time (time) : 281.
Elapsed convergence loop time (chrono) : 280245.00.

Dissipation converged in 280111 iterations.
With max DSV = 0.085120 and min DSV = 0.081715.
Affect rate = 0.040000; Epsilon: 0.040000.
Elapsed convergence loop time (clock) : 265670000.
Elapsed convergence loop time (time) : 266.
Elapsed convergence loop time (chrono) : 266102.00.

Lab5 MPI with Openmp outcome:

Dissipation converged in 460895 iterations.
With max DSV = 0.085007 and min DSV = 0.082457.
Affect rate = 0.030000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 76450000.
Elapsed convergence loop time (time) : 76.
Elapsed convergence loop time (chrono) : 76442.273438.

Dissipation converged in 326531 iterations.
With max DSV = 0.084885 and min DSV = 0.082338.
Affect rate = 0.040000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 55010000.
Elapsed convergence loop time (time) : 55.
Elapsed convergence loop time (chrono) : 55010.136719.

Dissipation converged in 280115 iterations.
With max DSV = 0.085120 and min DSV = 0.081715.
Affect rate = 0.040000; Epsilon: 0.040000.
Elapsed convergence loop time (clock) : 46250000.
Elapsed convergence loop time (time) : 47.
Elapsed convergence loop time (chrono) : 46246.269531.

Lab4 Cuda outcome:

Threads requested: 17.
Dissipation converged in 462542 iterations.
With max DSV = 0.085007 and min DSV = 0.082457.
Affect rate = 0.030000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 97790000.
Elapsed convergence loop time (time) : 98.
Elapsed convergence loop time (chrono) : 97763.015625.

Threads requested: 17.
Dissipation converged in 326515 iterations.
With max DSV = 0.084884 and min DSV = 0.082337.
Affect rate = 0.040000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 69180000.

Elapsed convergence loop time (time) : 70.
Elapsed convergence loop time (chrono) : 69148.632812.

Threads requested: 17.
Dissipation converged in 280135 iterations.
With max DSV = 0.085120 and min DSV = 0.081715.
Affect rate = 0.040000; Epsilon: 0.040000.
Elapsed convergence loop time (clock) : 60670000.
Elapsed convergence loop time (time) : 61.
Elapsed convergence loop time (chrono) : 60656.738281.

Lab3 Openmp outcome:

Threads requested: 28; Threads created: 28.
Dissipation converged in 460895 iterations.
With max DSV = 0.085007 and min DSV = 0.082457.
Affect rate = 0.030000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 1638000000.
Elapsed convergence loop time (time) : 59.
Elapsed convergence loop time (chrono) : 58581.902344.

Threads requested: 28; Threads created: 28.
Dissipation converged in 326531 iterations.
With max DSV = 0.084885 and min DSV = 0.082338.
Affect rate = 0.040000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 1205310000.
Elapsed convergence loop time (time) : 43.
Elapsed convergence loop time (chrono) : 43125.585938.

Threads requested: 28; Threads created: 28.
Dissipation converged in 280115 iterations.
With max DSV = 0.085120 and min DSV = 0.081715.
Affect rate = 0.040000; Epsilon: 0.040000.
Elapsed convergence loop time (clock) : 999680000.
Elapsed convergence loop time (time) : 36.
Elapsed convergence loop time (chrono) : 35748.781250.

Lab2 Pthread outcome:

Dissipation converged in 460895 iterations.
With max DSV = 0.085007 and min DSV = 0.082457.
Affect rate = 0.030000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 729020000.
Elapsed convergence loop time (time) : 147.
Elapsed convergence loop time (chrono) : 147099.25.

Dissipation converged in 326531 iterations.
With max DSV = 0.084885 and min DSV = 0.082338.
Affect rate = 0.040000; Epsilon: 0.030000.
Elapsed convergence loop time (clock) : 512070000.
Elapsed convergence loop time (time) : 103.
Elapsed convergence loop time (chrono) : 103591.39.

Dissipation converged in 280115 iterations.
With max DSV = 0.085120 and min DSV = 0.081715.
Affect rate = 0.040000; Epsilon: 0.040000.
Elapsed convergence loop time (clock) : 443250000.
Elapsed convergence loop time (time) : 89.
Elapsed convergence loop time (chrono) : 89849.19.

- describes the workload distribution used for this lab
- provides summary comparative runtime results for all implementations of SAMR (labs 1 - 5)
- your descriptions and analysis of any unexpected results
- a brief summary of the applicability of the various parallelization APIs discussed this semester

1. For workload, I first bcast all data I need into 1-4 ranks. In computation part, I separated all data into 4 sections, like. 0-3050,3051-6101,6102-9152,9153-12205 and compute them in different ranks, with first section in rank 1, second in 2... After that, I used MPI_Send and MPI_Recv to collect data from rank 1-4 to rank 0 with corresponding section. In rank 0, I updated the grid_box_dsv with new value and check the convergence. If it is not convergence, bcast the new grid_box_dsv to all ranks and redo the computation part.

2. In the above.

3. It seems that my outcomes are all under my expectation.

4. For that Pthread and Openmp are based on Shared memory system and Mpi is based on distributed memory system, we can apply mpi when there are multiple devices are working with one project. Pthread is a library while openmp is a compiler modification, so the difference between them are implementation. For cuda, the communication between device and host is quite annoying and time assuming. So for some basic matrix manipulation or computation task, I don't think cuda is a good way.