CSC4005: Distributed and Parallel Computing

Assignment4: Heat simulation

1 description

Figure 1 shows a room has four walls and a fireplace. The temperature of the wall is 20^{o}C, and the temperature of the fireplace is 100^{o}C. Write MPI, Pthread, and OpenMP programs using Jacobi iteration to compute the temperature inside the room and plot (preferably in color) temperature contours at 5^{o}C intervals using Xlib or other GUI systems on your computers in each iteration.

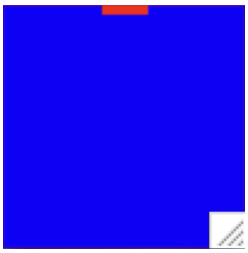

Figure 1: Example of a room has four walls and a fireplace.

Bounus(10 points): Write an MPI + OpenMP program for the problem described above.

2 requirement

- You need to implement four versions of the tasks, which are **Sequential**, **openMP version**,**MPI version** and a **Pthread version**. And hand in the codes for these four versions in four seperate code files. You need to print the following information for your codes including your **name, student id, assignment id, implementation version, running time of the program**.(see the folloing figure.)

```
Name:
Student ID:
Assignment 2, Mandelbrot Set, MPI implementation.
runTime is
```

- In your submit code, it should display an video with size of 200 $\times$ 200, running for a fixed iteration. And different color should represents different temperature, for example, higher temperature corresponds to red color while cold tempoerature coorespodns to blue color.
- Include the results in your report by capturing a picture on your screen.
- Record a video of your result.
- For the openMP program, you should evaluate it like Pthread with specific number of threads.

- You need to specify the **command line** about how to **compile** and **run** your program.
- You need to **compare the performance** of different implementation and configurations in your report.
  - The number of processes or threads used in the program (up to **at least** 16 processes and threads)
  - MPI vs Sequential vs Pthread vs OpenMP
  - Compare under three different sizes of the output images.
  - More if you have
- You need to include **three figures** describing the structure of your MPI program, Pthread program and openMP program.
- The report should be written in appropriate format which you could refer to the report template.

3 Where and What to Turn in Your Homework

- Please turn in
  - Report
  - Codes
  - video recording your result
- zip your source codes, result video, paper in a zip file, and name it studentID.zip, then submit it on Blackboard.
- Late submission penalty, 5 points deduction for each 12 hours after the deadline. If it is late more than four days, you will receive a 0 score.

4 Due:

23:59,Dec,15,2020