HW1 - a Simple Filter on 1D array

MGP 2022 Spring
Due - 3.18 11:59pm

In this homework, you will get a simple practice of using std::thread, and implementing an easy parallel algorithm.

In the given source code, there is a serial version of a simple filter on 1D array implemented.

When you type "make remote", the algorithm will run in about 1.3 sec.
Your job is to write a parallel version, and make the runtime below 0.9 sec.
If the runtime is below 0.5 sec, you will get some bonus scores.

It's not that hard, and it has a pretty large margin over what you can actually achieve.
You don't have to submit any written materials like a report.

1. ssh into the server [acsys01.yonsei.ac.kr] using your account.
2. Unzip the file: unzip HW1.zip
3. cd HW1

- make filter
    - this will compile your program(./filter)

- make run
    - this will run your program in the login node. The performance here is not important.

- make remote

```
mgp10xxx@acsys01:~/HW1$ make remote
condor_submit hw1.cmd
Submitting job(s).
1 job(s) submitted to cluster xxxxx.
```

Now the program will be sent to the remote node, which is our target machine. Now you should care about the outcomes.

- make queue

```
-- Schedd: acsys01 : <165.132.104.5:9618?... @ 03/10/22 14:23:09
OWNER   BATCH_NAME  SUBMITTED   DONE   RUN    IDLE   TOTAL  JOB_IDS
mgp10xxx   ID: xxxxx          3/10 14:23      _        1       _        1       xxxxx.0

Total for query: 1 jobs; 0 completed, 0 removed, 0 idle, 1 running, 0 held, 0 suspended
Total for mgp10xxx: 1 jobs; 0 completed, 0 removed, 0 idle, 1 running, 0 held, 0 suspended
Total for all users: 1 jobs; 0 completed, 0 removed, 0 idle, 1 running, 0 held, 0 suspended
```

The above indicates that your job is running. When done, the job will disappear from the list, and we can check the outcome from the out.txt

- cat out.txt

```
mgp10099@acsys01:~/HW1$ cat out.txt
init took 0.746217 sec
serial 1D filter took 1.35641 sec
parallel 1D filter took 2e-08 sec
ERROR at 0: Serial[0] = 2 Parallel[0] = 0
err: 2
ERROR at 1: Serial[1] = 3 Parallel[1] = 0
err: 3
ERROR at 2: Serial[2] = 4 Parallel[2] = 0
err: 4
ERROR at 3: Serial[3] = 5 Parallel[3] = 0
err: 5
There are 1073741820 errors
```

This shows that your program ran in 1.36 sec. The parallel 1D filter didn't take any time, because it does not do anything yet.

Also, check **README.md.**

Now your job is to implement a parallel version that runs under 0.9 sec. Have fun!

(See the last page for additional rules.)

[Rules]

1. put your HW1 directory under <your_home>/HW1
    a. All your make commands, especially 'make filter' and 'make remote' should work.
2. Do not change any of the output(i.e. 'std::cout') statements. We will grade based on the program outputs. Any change on the outputs would probably cause an error, leading to 0 points for your HW assignment.
3. Don't touch anything in the directory after the deadline. If any of the timestamps are later than the deadline, we will treat it as 'late submission'.
4. When submitting jobs, any job that's running for longer than 60 sec. will be kicked out by the policy.
5. You can't use OpenMP for this assignment.
6. Please retain adequate permission on your files to avoid plagiarism.
7. No abusing. Please use your common sense.