Programming assignment

Multicore Systems
Cannon’s matrix-matrix multiplication

- Described by Lynn Elliot Cannon
  - Matrix multiplication for two dimensional meshes
  - Distributed algorithm

- Algorithm

```
row i of matrix a is circularly shifted by i elements to the left.
col j of matrix b is circularly shifted by j elements up.
Repeat n times:
p[i][j] multiplies its two entries and adds to running total.
circular shift each row of a 1 element left
  circular shift each col of b 1 element up
```
Source code

- Given source code list
  - main.c
  - lcgrand.h
  - lcgrand.c
  - cannon.h
  - cannon_blk.c
  - cannon_nonblk.c (same as cannon_blk.c)
  - Makefile

- You can **ONLY** change
  - cannon.h
  - cannon.c
  - Makefile
MPI

• Given source codes can compile immediately

• At server, sequential time is nearly 35~40 sec

• Assignment is modification of sequential to parallel by using MPI

• You must make cannon’s multiplication by using two API
  – Blocking communication
  – Non-blocking communication
Server execution

- `test_multicore_project.sh --me --submit [core number]`
  - Example: `test_multicore_project.sh --me --submit 4`

- Any other commands are same

- Binary name should be “cannon”

- Modify Makefile to test at server

- You must test & get result about cases using 4, 8, 16 threads both blocking and non-blocking
Grade

- Exercise 2 is total 4 points (Total assignment is 40 points)

- If your parallel execution time is
  - Lower than \( \frac{40}{\text{thread num} / 2} \), then you will get 3 points
  - \( 40 \) is sequential time

- If not, subtracted 0.5 points in each case

- README is 1 point (in case about running successfully)
  - Analyze & Describe why blocking & non-blocking execution time is different
Submission

- Submit through iCampus
- Due date is until 5/31 midnight
- Please remove all ‘#’ in Makefile

- StudentID.tar
  - `mkdir StudentID` (ex. `mkdir 2012345678`)
  - `mv` or `cp` your source code `StudentID`
    
    (ex. `mv cannon.h cannon_*.c Makefile 2012345678`)
  - `tar cvf 2012345678.tar 2012345678`
  - Necessary file is `cannon.h, cannon_blk.c, cannon_nonblk.c, Makefile` and `README`
  - You **CANNOT** change `main.c lcgrand.c lcgrand.h`