CSE344 SYSTEM PROGRAMING HW5

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*main(int argc, char *argv[])*

-Read file attach matrix

-Create thread

void calc(void *a)*

for (int j=info->conId*(pow(2,N)/info->Mnum) ; j <info->conId*(pow(2,N)/info->Mnum)+(pow(2,N)/info->Mnum); j++)

Thread number is assigned appropriately. Then, the place where each thread will be hosted is set with the formula j=info->conId*(pow(2,N)/info->Mnum in the loop. For example, thread 1 from thread 0 point It will start at (pow(2,N)/info->Mnum number.

info->conId*(pow(2,N)/info->Mnum)+(pow(2,N)/info->Mnum)

Then the starting point plus the number of columns divided by the number of threads was added and the end point of each thread was calculated.

```
pthread_mutex_lock(&mutex1);
    ++arrived;
    if(arrived < info->Mnum)
    {
       pthread_cond_wait(&cond,&mutex1);
    }
    else
    {
       pthread_cond_broadcast(&cond);
    }
    pthread_mutex_unlock(&mutex1);
```

Barrier process was applied.2. All threads were expected to finish the 1st stage before proceeding to the first stage.

and fourier's theorem was applied. Division of threads was done in the same way as multiplication.

Compare

```
orkun@orkun:~/Desktop/hw5$ ./hw5 -i A.csv -j B.csv -o output.csv -n 4 -m 2
Two matrices of size 16x16 have been read. The number of threads is 2
Thread 0 has reached the rendezvous point in 0.00210 seconds.
Thread 1 has reached the rendezvous point in 0.00305 seconds.
Thread 1 is advancing to the second part
Thread 0 is advancing to the second part
Thread 0 has has finished the second part in 0.52544 seconds.
Thread 1 has has finished the second part in 0.52689 seconds.
orkun@orkun:~/Desktop/hw5$ ./hw5 -i A.csv -j B.csv -o output.csv -n 4 -m 4
Two matrices of size 16x16 have been read. The number of threads is 4
Thread 3 has reached the rendezvous point in 0.00071 seconds.
Thread 2 has reached the rendezvous point in 0.00220 seconds.
Thread 1 has reached the rendezvous point in 0.00365 seconds.
Thread 0 has reached the rendezvous point in 0.00476 seconds.
Thread 0 is advancing to the second part
Thread 2 is advancing to the second part
Thread 1 is advancing to the second part
Thread 3 is advancing to the second part
Thread 1 has has finished the second part in 0.17283 seconds.
Thread 0 has has finished the second part in 0.18247 seconds.
Thread 3 has has finished the second part in 0.21000 seconds.
Thread 2 has has finished the second part in 0.21053 seconds.
orkun@orkun:~/Desktop/hw5$ ./hw5 -i A.csv -j B.csv -o output.csv -n 4 -m 8
Two matrices of size 16x16 have been read. The number of threads is 8
Thread 0 has reached the rendezvous point in 0.00119 seconds.
Thread 2 has reached the rendezvous point in 0.00019 seconds.
Thread 1 has reached the rendezvous point in 0.00036 seconds.
Thread 3 has reached the rendezvous point in 0.00062 seconds.
Thread 4 has reached the rendezvous point in 0.00017 seconds.
Thread 7 has reached the rendezvous point in 0.00019 seconds.
Thread 5 has reached the rendezvous point in 0.00034 seconds.
Thread 6 has reached the rendezvous point in 0.00012 seconds.
Thread 6 is advancing to the second part
Thread 0 is advancing to the second part
Thread 2 is advancing to the second part
Thread 3 is advancing to the second part
Thread 4 is advancing to the second part
Thread 7 is advancing to the second part
Thread 5 is advancing to the second part
Thread 1 is advancing to the second part
Thread 7 has has finished the second part in 0.09004 seconds.
Thread 1 has has finished the second part in 0.09144 seconds.
Thread 0 has has finished the second part in 0.09369 seconds.
Thread 5 has has finished the second part in 0.09147 seconds.
Thread 2 has has finished the second part in 0.09250 seconds.
Thread 4 has has finished the second part in 0.09249 seconds.
Thread 3 has has finished the second part in 0.09374 seconds.
Thread 6 has has finished the second part in 0.09560 seconds.
```

```
orkun@orkun:~/Desktop/hw5$ ./hw5 -i A.csv -j B.csv -o output.csv -n 4 -m 16
Two matrices of size 16x16 have been read. The number of threads is 16
Thread 0 has reached the rendezvous point in 0.00059 seconds.
Thread 5 has reached the rendezvous point in 0.00009 seconds.
Thread 3 has reached the rendezvous point in 0.00082 seconds.
Thread 2 has reached the rendezvous point in 0.00097 seconds.
Thread 8 has reached the rendezvous point in 0.00021 seconds.
Thread 6 has reached the rendezvous point in 0.00011 seconds.
Thread 1 has reached the rendezvous point in 0.00162 seconds.
Thread 7 has reached the rendezvous point in 0.00041 seconds.
Thread 11 has reached the rendezvous point in 0.00012 seconds.
Thread 10 has reached the rendezvous point in 0.00040 seconds.
Thread 13 has reached the rendezvous point in 0.00008 seconds.
Thread 14 has reached the rendezvous point in 0.00012 seconds.
Thread 4 has reached the rendezvous point in 0.00217 seconds.
Thread 12 has reached the rendezvous point in 0.00108 seconds.
Thread 9 has reached the rendezvous point in 0.00168 seconds.
Thread 15 has reached the rendezvous point in 0.00111 seconds.
Thread 15 is advancing to the second part
Thread 5 is advancing to the second part
Thread 3 is advancing to the second part
Thread 2 is advancing to the second part
Thread 8 is advancing to the second part
Thread 6 is advancing to the second part
Thread 1 is advancing to the second part
Thread 7 is advancing to the second part
Thread 11 is advancing to the second part
Thread 10 is advancing to the second part
Thread 13 is advancing to the second part
Thread 14 is advancing to the second part
Thread 4 is advancing to the second part
Thread 12 is advancing to the second part
Thread 9 is advancing to the second part
Thread 0 is advancing to the second part
Thread 8 has has finished the second part in 0.03913 seconds.
Thread 0 has has finished the second part in 0.05158 seconds.
Thread 5 has has finished the second part in 0.05237 seconds.
Thread 2 has has finished the second part in 0.05286 seconds.
Thread 3 has has finished the second part in 0.05295 seconds.
Thread 6 has has finished the second part in 0.05179 seconds.
Thread 15 has has finished the second part in 0.06632 seconds.
Thread 11 has has finished the second part in 0.08327 seconds.
Thread 1 has has finished the second part in 0.09049 seconds.
Thread 10 has has finished the second part in 0.08959 seconds.
Thread 13 has has finished the second part in 0.09694 seconds.
Thread 7 has has finished the second part in 0.10186 seconds.
Thread 4 has has finished the second part in 0.12928 seconds.
Thread 12 has has finished the second part in 0.12899 seconds.
Thread 14 has has finished the second part in 0.13059 seconds.
Thread 9 has has finished the second part in 0.13739 seconds.
orkun@orkun:~/Desktop/hw5$
```

Tried 2,4,8,16 as the number of threads. It worked in 16x16 matrix. It worked faster up to 16 threads, but it was seen that it worked slower with 16 threads.

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                8
On-line CPU(s) list:   0-7
Thread(s) per core:    2
Core(s) per socket:    4
Socket(s):             1
NUMA node(s):          1
```

OUTPUT

REAL PART															
-3915139840	-2255262976	4017385216	1179748224	3232419584	5073106432	-1985129856	-3913117952	11650695168	-3913118208	-1985129600	5073106944	3232419840	1179748224	4017385216	-2255262976
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IMAGINARY PART															
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