Final Projcet (2021-27764 안지수)

1. 실행법

```
salloc --nodes=2 --ntasks-per-node=4 --cpus-per-task=2 \
                        --gres=gpu:4 --partition=shpc  \
                          mpirun ./facegen_parallel  \
                          network.bin input3.txt output3.txt output3.bmp

or

make test
```

병렬화 방법

1. GPU 병렬화 (모든 kernel을 1차원으로 병렬화)

2. MPI 사용(node 2개 task-per-node 4) + Device 설정으로 각 노드당 4개의 GPU를 사용하게 함
rank0 노드를 제외한 모든 노드는 int(num_of_noise / num_of_task)개의 noise를 담당하고 잔여분을 rank0 노드가 담당하게 하여 병렬화를 구현

3. Double buffering
버퍼의 크기를 noise 1개 크기(100*sizeof(float)으로 설정)하여 double buffering을 진행

4. tconv에서 weight를 global 변수에 따로 담아 성능 향상

성능 측정

```
input1 : 0.306617 sec
input2 : 0.919842 sec
input3 : 6.180233 sec
```

```
mpicc -o facegen_parallel main.o qdbmp.o timer.o facegen_parallel.o -lm -lrt -lstdc++ -L/usr/local/cuda/lib64 -lcudart
salloc --nodes=2 --ntasks-per-node=4 --cpus-per-task=2 --gres=gpu:4 --partition=shpc mpirun ./facegen_parallel network.
bin input1.txt output1.txt output1.bmp
salloc: Granted job allocation 107917
Reading 'network.bin'... done!
Reading 'input1.txt'... done!
Initializing... node(0)
Initializing... node(4)
Initializing... node(1)
Initializing... node(2)
Initializing... node(5)
Initializing... node(3)
Initializing... node(6)
Initializing... node(7)
 done!
 done!
 done!
 done!
 done!
 done!
 done!
Calculating... done!
 done!
Elapsed time : 0.306617 sec
Writing 'output1.txt'... done!
Writing 'output1.bmp'...Finalizing...node(6)
Finalizing...node(1)
Finalizing...node(4)
Finalizing...node(3)
Finalizing...node(5)
Finalizing...node(2)
Finalizing...node(7)
 done!
Finalizing...node(0)
 done! node(6)
 done! node(5)
 done! node(7)
 done! node(4)
 done! node(0)
 done! node(3)
 done! node(2)
 done! node(1)
salloc: Relinquishing job allocation 107917
```

```
shpc121@login0:~/snu_shpc21/facegen$ make test
mpicc -o facegen_parallel main.o qdbmp.o timer.o facegen_parallel.o -lm -lrt -lstdc++ -L/usr/local/cuda/lib64 -lcudart
salloc --nodes=2 --ntasks-per-node=4 --cpus-per-task=2 --gres=gpu:4 --partition=shpc mpirun ./facegen_parallel network.
bin input2.txt output2.txt output2.bmp
salloc: Pending job allocation 107936
salloc: job 107936 queued and waiting for resources
salloc: job 107936 has been allocated resources
salloc: Granted job allocation 107936
Reading 'network.bin'... done!
Reading 'input2.txt'... done!
Initializing... node(0)
Initializing... node(4)
Initializing... node(3)
Initializing... node(1)
Initializing... node(2)
Initializing... node(5)
Initializing... node(6)
Initializing... node(7)
 done!
 done!
 done!
 done!
 done!
 done!
 done!
Calculating... done!
 done!
Elapsed time : 0.919842 sec
Writing 'output2.txt'... done!
Writing 'output2.bmp'... done!
Finalizing...node(2)
Finalizing...node(3)
Finalizing...node(1)
Finalizing...node(4)
Finalizing...node(0)
Finalizing...node(6)
Finalizing...node(7)
Finalizing...node(5)
 done! node(7)
 done! node(5)
 done! node(6)
 done! node(4)
 done! node(3)
 done! node(2)
 done! node(0)
 done! node(1)
salloc: Relinquishing job allocation 107936
```

```
shpc121@login0:~/snu_shpc21/facegen$ make test
mpicc -o facegen_parallel main.o qdbmp.o timer.o facegen_parallel.o -lm -lrt -lstdc++ -L/usr/local/cuda/lib64 -lcudart
salloc --nodes=2 --ntasks-per-node=4 --cpus-per-task=2 --gres=gpu:4 --partition=shpc mpirun ./facegen_parallel network.
bin input3.txt output3.txt output3.bmp
salloc: Pending job allocation 107945
salloc: job 107945 queued and waiting for resources
salloc: job 107945 has been allocated resources
salloc: Granted job allocation 107945
Reading 'network.bin'... done!
Reading 'input3.txt'... done!
Initializing... node(0)
Initializing... node(4)
Initializing... node(5)
Initializing... node(7)
Initializing... node(1)
Initializing... node(6)
Initializing... node(3)
Initializing... node(2)
 done!
 done!
 done!
 done!
 done!
 done!
 done!
 done!
Calculating... done!
Elapsed time : 6.180233 sec
Writing 'output3.txt'... done!
Writing 'output3.bmp'... done!
Finalizing...node(3)
Finalizing...node(1)
Finalizing...node(0)
Finalizing...node(2)
Finalizing...node(5)
Finalizing...node(4)
Finalizing...node(7)
Finalizing...node(6)
 done! node(7)
 done! node(4)
 done! node(5)
 done! node(6)
 done! node(3)
 done! node(1)
 done! node(2)
 done! node(0)
```