Report 2

Quan Fan | 862099688 | [qfan005@ucr.edu](mailto:qfan005@ucr.edu)

# Part 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | Time (seconds) | | Performance (GFLOPS) | |
| Lapack | my version | Lapack | my version |
| 1000 | 0.064579 | 3.668186 | 10.3542431 | 0.1822881 |
| 2000 | 0.463179 | 29.852558 | 11.5318988 | 0.17892381 |
| 3000 | 1.452284 | 100.91096 | 12.4066643 | 0.17855345 |
| 4000 | 3.370753 | 239.525575 | 12.6673971 | 0.1782635 |
| 5000 | 6.345522 | 467.8553 | 13.1405002 | 0.17822462 |

NOTE: The total number of float-point operation is 2/3\*n^3 + n^2 + n^2, as mentioned on slides page 44.

## How To Run

#NOTE: lapack is located in home directory (~/lapack-3.8.0)

Make part1

Sbatch part1.job.sh

# Part 2

I used blocked version of dgemm3 with cache reusing in project 1 to perform the matrix multiplication during the LU factorization step. According to Project 1, the optimal block size is 126. Then I shift the N to avoid boundary condition problems. I also present the result of both with and without -O2 compiler flag.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | Time (seconds) | | | |
| Lapack | my version | my block version | my block version -O2 |
| 1008 | 0.068124 | 3.72935 | 1.28587 | 0.302005 |
| 2016 | 0.479404 | 30.376102 | 8.22751 | 1.936633 |
| 3024 | 1.483592 | 103.087115 | 25.037408 | 6.100866 |
| 4032 | 3.500611 | 243.67154 | 58.374398 | 14.36271 |
| 5040 | 6.472502 | 477.564157 | 107.632305 | 26.852303 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | Performance (GFLOPS) | | | |
| Lapack | my version | my block version | my block version -O2 |
| 1008 | 10.052656 | 0.18363177 | 0.532578827 | 2.26760198 |
| 2016 | 11.4110199 | 0.18009186 | 0.664902088 | 2.824742001 |
| 3024 | 12.4385642 | 0.17901126 | 0.737047316 | 3.024776215 |
| 4032 | 12.4925033 | 0.17946862 | 0.749153671 | 3.04478713 |
| 5040 | 13.1943071 | 0.17882452 | 0.793443745 | 3.180367032 |

## How To Run

#NOTE: lapack is located in home directory (~/lapack-3.8.0)

Make part2 #This will produce two executable files: part2 and part2\_o2

Sbatch part2.job.sh #This will run ./part2 and ./part2\_o2 sequentially and put the result together in p2.txt

# Correctness

I check all the results towards lapack version by checking if the maximum difference is smaller than 1e-2.