**Project #5**

**Functional Decomposition**

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**Machine:** DGX Systems

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|  |  | **NUMTRIALS** | | | | | | |
| **BLOCKSIZE** |  | 16384 | 32768 | 65536 | 131072 | 262144 | 524288 | 1048576 |
| 16 | 500 | 939.45 | 1747.44 | 2805.48 | 4478.95 | 5607.11 | 6907.25 |
| 32 | 516.13 | 1003.93 | 1863.51 | 3379.54 | 5669.2 | 8035.31 | 11248.88 |
| 64 | 533.33 | 982.73 | 1965.45 | 3571.05 | 6543.13 | 9199.33 | 13855.4 |
| 128 | 533.33 | 1051.33 | 2102.67 | 4003.91 | 6895.62 | 9609.39 | 14051.46 |

Performance : MegaTrials/Second

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|  |  | **NUMTRIALS** | | | | | | |
| **BLOCKSIZE** |  | 16384 | 32768 | 65536 | 131072 | 262144 | 524288 | 1048576 |
| 16 | 10.09 | 9.99 | 9.96 | 10.12 | 9.97 | 10.06 | 10 |
| 32 | 9.98 | 9.92 | 10.12 | 10.05 | 10.08 | 9.94 | 10 |
| 64 | 10.35 | 10.22 | 9.99 | 9.97 | 10.07 | 9.97 | 10 |
| 128 | 10.2 | 9.82 | 10 | 9.99 | 9.98 | 9.99 | 10.04 |

Monte Carlo performance table

**What patterns are you seeing in the performance curves?**

As the number of trials and block size increase, performance will increase.

**Why do you think the patterns look this way?**

I think that with the data parallelism on the GPU, as the data set size increases, the performance usually increases. And generally, the more threads there are in each workgroup, the performance will be higher.

**Why is a BLOCKSIZE of 16 so much worse than the others?**

When the BLOCKSIZE is 16, the performance will be significantly worse, because the number of threads in the warp is 32. Therefore, when the BLOCKSIZE is 16, it will be worse.

**How do these performance results compare with what you got in Project #1? Why?**

The maximum performance of Project #1 was 175.05 MegaTrials/Second with 32 threads and 1,000,000 number of trials (The data is from my project #1). The maximum performance of Project #5 was 14051.46 MegaTrials/Second with 128 block size and 1,048,576 number of trials. The number of trials is similar, but the performance is improved by more than 80x.

**What does this mean for the proper use of GPU parallel computing?**

If you want to consider using CUDA, you should have a larger data set size, and each work group should have at least 32 work items. Then try to see whether adding more work items to the workgroup can improve performance (in multiples of 32). In conclusion, if you have the opportunity to use CUDA or OpenMP, CUDA is the first way to consider, because its performance will be better than OpenMP comes well.