

CS575(Introduction To Parallel Programming)
Project5

Project Title : CUDA Monte Carlo(Project 5)

Name : Si Thu Lin

ID : 933-957-884

Email : linsi@oregonstate.edu

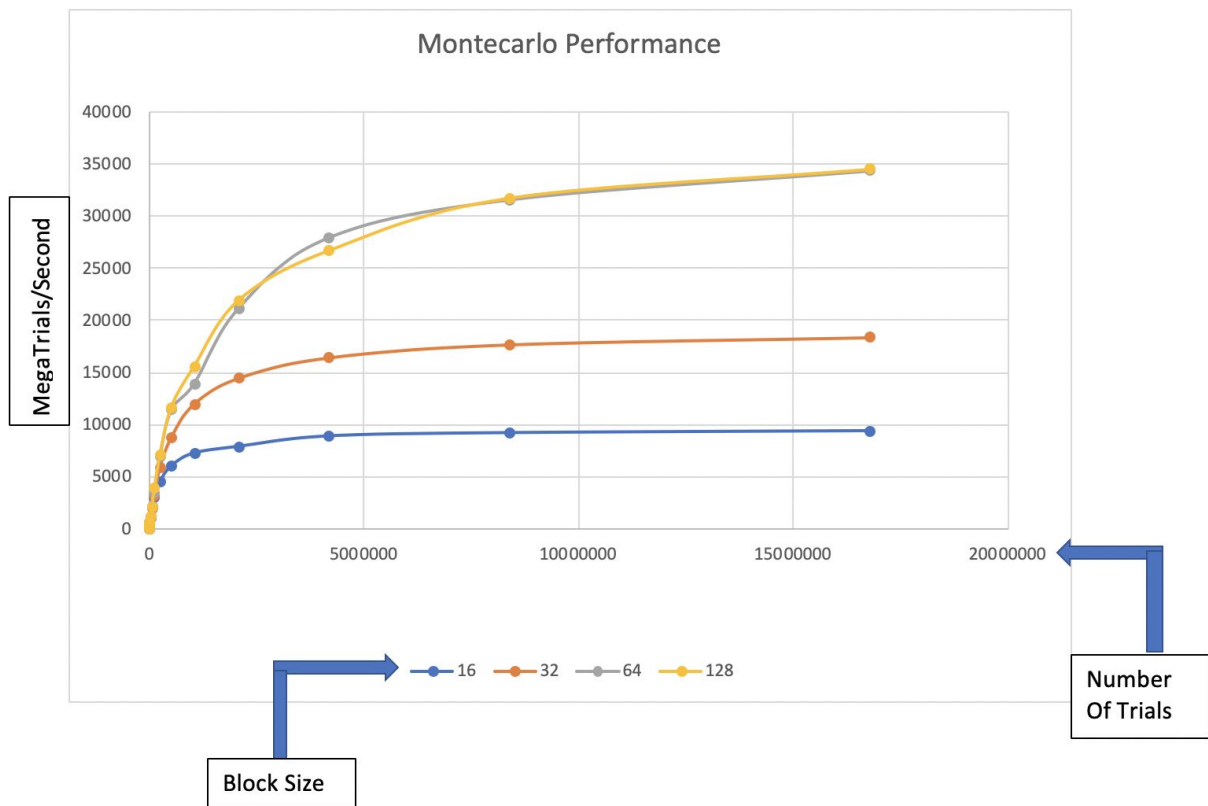
The code was run on the DGX system. I also tried to compile the code on the Rabbit System.
The probability is always around 42.%.

The Table of Performance

BLOCKSIZE	NUMTRIALS	PERFORMANCE
16	1024	35.7143
16	2048	74.0741
16	4096	160
16	8192	250
16	16384	571.4286
16	32768	980.8429
16	65536	2033.7637
16	131072	2994.1519
16	262144	4498.6271
16	524288	6021.3157
16	1048576	7246.3512
16	2097152	7894.9523
16	4194304	8892.2662
16	8388608	9204.4941
16	16777216	9388.6075
32	1024	22.7273
32	2048	62.5
32	4096	148.1481
32	8192	258.0645
32	16384	470.5882
32	32768	1030.1811
32	65536	1921.2008
32	131072	3202.5021
32	262144	5863.9941
32	524288	8747.4642
32	1048576	11928.6496
32	2097152	14454.3447
32	4194304	16416.8331
32	8388608	17674.2176
32	16777216	18361.9236
64	1024	35.7143
64	2048	66.6667
64	4096	133.3333
64	8192	285.7143

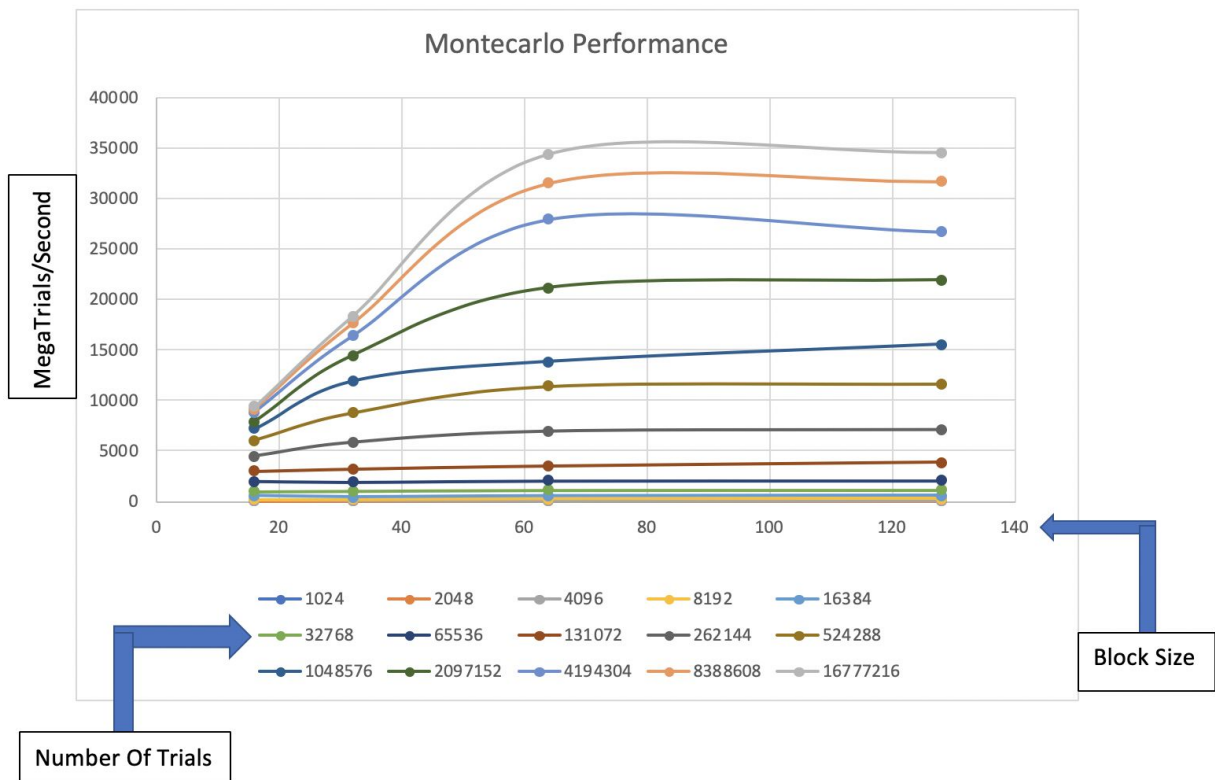
BLOCKSIZE	NUMTRIALS	PERFORMANCE
64	16384	551.7241
64	32768	1117.9039
64	65536	2077.079
64	131072	3497.8652
64	262144	6977.8536
64	524288	11417.4217
64	1048576	13861.2517
64	2097152	21188.4899
64	4194304	27947.1224
64	8388608	31572.2041
64	16777216	34357.0123
128	1024	37.037
128	2048	71.4286
128	4096	142.8571
128	8192	296.2963
128	16384	592.5926
128	32768	1125.2747
128	65536	2091.9305
128	131072	3867.7997
128	262144	7135.8884
128	524288	11669.5158
128	1048576	15544.5921
128	2097152	21955.1095
128	4194304	26711.2295
128	8388608	31744.2479
128	16777216	34519.8837

The Graph of the Performance and the number of Trials



The blue line which represents the performance for the 16 block size is much lower than other lines which represent other block sizes. I believe the cause for that is that a Warp contains 32 threads, and 16 threads(half of a Warp) is unused and wasted when the block size is only 16. Therefore, the block size should be at least 32 which is a Warp size so that a good performance can be achieved. The gray and yellow lines which represent the performance of the 64 and 128 block size respectively have almost the same results. I opine that the reason is that the performance may have hit the maximum level. In other words, the blocks are run by the SMs(Streaming Multiprocessors) and SMs have a limited number of cores on them and all the cores are used when the block sizes are 64 and 128.

The Graph of the Performance and the Block Size



The performance in the Project5 achieved by using the CUDA is much better than that in the Project1 achieved by not using CUDA. In the Project1, a relatively small number of cores could be used in the Project1 because GPU where there are a considerable number of available cores to be used was not used. In the Project5, GPU was used and so many threads were used that each data in the array was operated on by individual threads in parallel. That is the reason why the Performance in the Project5 is very great and why the GPU should be used.