PROJECT 05

CUDA Monte Carlo Simulation

CS 475
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Andrew Sabin
sabinand@oregonstate.edu

What machine did I run this on?

I ran the program on the Oregon State DGX machine after connecting to it from the rabbit server.

What do you think this new probability is?

Judging from what I've seen with this code, probability represents the percentage of how likely a golf ball is to get into the hole based on how many golf balls are in the number of trails.

Table and Graphs

Table 1

	1024	4096	16384	65536	262144	1048576	2097152
8	27.027	74.0741	340.4255	1111.2317	2479.4189	3982.4987	4380.456
32	23.2558	81.6327	326.5306	1365.3333	4541.02	10590.8208	13476.4548
64	23.8095	93.0233	372.093	1433.17	4571.4285	12815.018	19151.3736
128	23.2558	80	320	1441.2386	5542.6253	14057.4857	21277.9225
256	23.2558	78.4314	363.6364	1450.4249	4790.6433	13721.9429	21564.9878

Table 1.) Rows represent the Block Size, Columns represent the Number of Trials, and the performance is what is being represented in each cell.

Table 2

	1024	4096	16384	65536	262144	1048576	2097152
8	71.19	70.68	71.57	71.03	70.83	70.99	70.96
32	66.8	70.19	71.3	71.01	71.01	70.91	70.95
64	72.07	70.73	70.85	71.21	71.01	70.95	70.95
128	70.61	69.87	71.16	70.83	71.11	70.94	70.99
256	70.41	71.7	71.59	70.87	71.05	70.96	70.97

Table 2.) Rows represent the Block Size, columns represent the Number of Trials, and the probability is the values within each cell.

Performance vs Number of Trials Graph

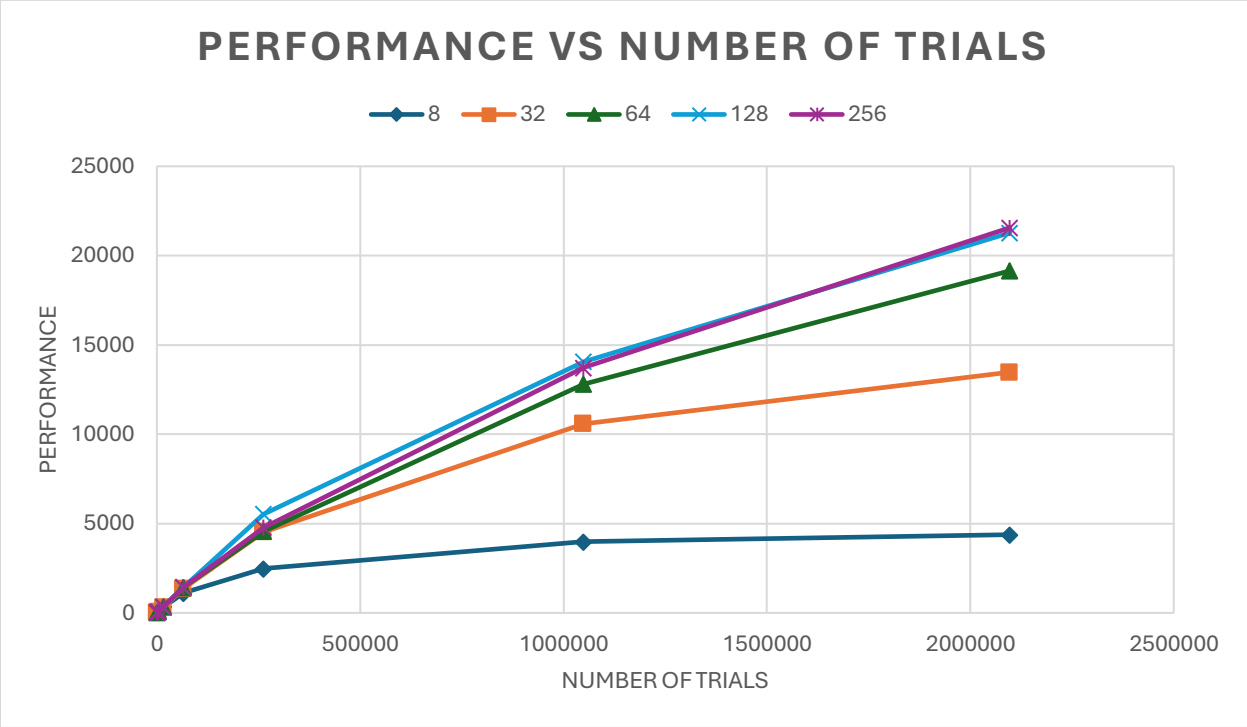

Figure 1.) Performance based on the number of trails. Colored lines represent the different Block Sizes

Performance vs Block Size

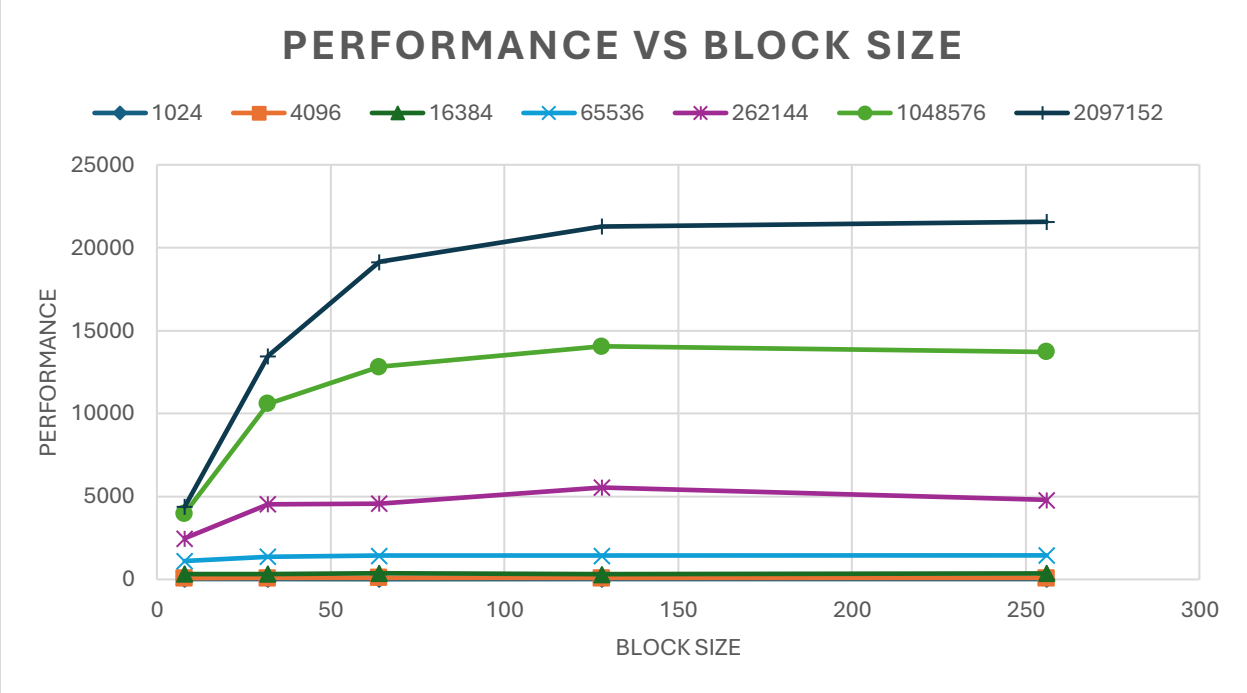

Figure 2.) The Performance based on the Block Size, where the colored lines represent the number of trials.

Commentary

What patterns are you seeing in the performance curves?

The block sizes with the best performance were the 128-block size by a small margin over 256 block size, it was only at the largest number of trials did 256 blocks overtake 128 blocks in performance.

With the number of trials with the best performance, the largest of the trials, 2097152, did substantially better than the rest of the number of trials. However, the performance peaks around the 128 block size and the performance remains relatively the same with larger block sizes.

Why do you think the patterns look this way?

With graphics cards the number of computations that can be done is much larger than CPUs and thus the performance won't be much different between 128 block sizes and 256 block sizes, due to the number of cores being larger on a graphics card than on a CPU.

However, the performance is much larger on the larger size number of trials because there is a lot more data that needs to be processed. Though the performance caps out around the 128-block mark because there is only a certain amount of cores that the GPU can give out to do computations at a time.

Why is a BLOCKSIZE of 8 so much worse than the others?

Block Size 8 is the worst because you're only allowing in 8 threads per block to do computations, and thus does significantly less computations per second in comparison to other block sizes which are able to output higher computations due to the increase in the number of threads per block doing computations.

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

The number of MegaTrials per second that were able to be done with the given block size were significantly higher than anything that could be done with the number of cores used by the CPU. This is because GPUs have access to way more cores that are designed to do more mathematical computations than a CPU, and thus have a higher output of computations per second than a CPU does.

What does this mean for what you can do with GPU parallel computing?

This means that GPU parallel computing can perform faster than CPU parallel computing when it comes to doing mathematical computations. If you need to get back a result faster and more efficiently, such as tasks with computer graphics or tasks related to AI then doing computing on a GPU would give you the best results.