Monte Carlo Simulations using CUDA parallelism

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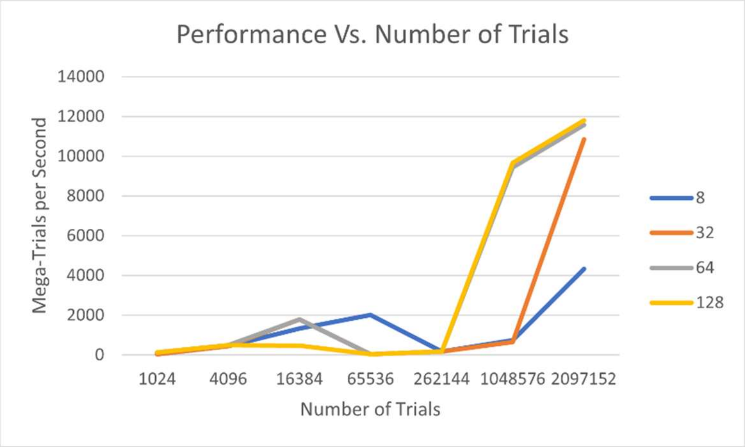
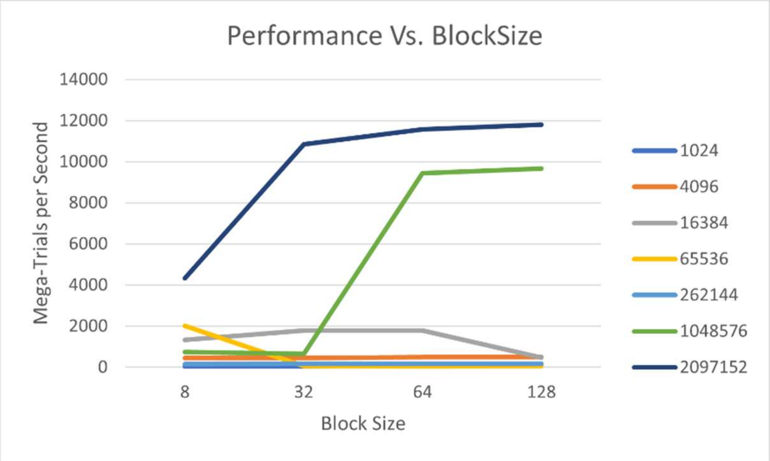
Sum of Mega-Trials per Second	Column Labels			
Row Labels	**8**	**32**	**64**	**128**
1024	30.303	29.4118	125	125
4096	444.4444	444.4444	500	500
16384	1333.3333	1777.7777	1777.7777	470.5882
65536	2011.7879	47.6102	47.425	47.6645
262144	165.4816	166.7006	165.5719	167.505
1048576	751.3012	648.1141	9448.6733	9674.6385
2097152	4324.3815	10846.7397	11582.8919	11806.1608

I ran this program on the DGX system.



To begin, I believe the new probability is 74.70 based on my data. This seemed to be the median value for my probability in my data.

In the performance curves, it’s very clear that the larger the data set, the more room there is for performance, which makes sense. Additionally, increasing the block size seems to generally improve performance on larger datasets. However, the relationship almost looks discreet in that there is a large jump from one block size’s performance to the others in larger datasets.



The reason that increasing the number of trials increases performance is that there is more room for improvement. As far as block size, it generally increases because the larger block sizes you use, the more room there is for parallelism as you are increasing the thread-count and amount of data you can operate on simultaneously. Specifically for block size 8, the reason it is so much worse than the others is that it's only using ¼ of a warp, which means it can only achieve around ¼ of its maximum performance.

As far as my comparison of performance for project 1, to be completely honest, I don't have access to that pdf anymore. But I believe that based on what I know about CUDA cores, since we're using the GPU and not the CPU to perform these operations, I'd probably observe much higher performance with this project.

Knowing this, using GPUs for parallel computing may be a much safer idea than using the CPU. Due to the higher thread counts and emphasis on parallelism within their physical hardware, they can achieve much higher performance than anything possible on a CPU.