2024

CS475- Project 1

OPENMP: MONTE CARLO SIMULATION

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Cores | Number of Trials	1	10	100	1000	10000	100000	500000	1000000
1	0.56	5.01	23.15	38.56	45.23	61.49	102.55	139.2
2	0.34	3.2	26.13	60.37	79.41	105.85	147.61	188.06
4	0.24	2.59	20.8	102.41	156.44	164.3	229.06	283.28
6	0.22	2.02	19.45	125.39	231.46	244.41	318.22	367.97
8	0.19	1.55	16.46	115.55	283.99	324.49	391.55	457.48

Table 1: Number of cores (y-axis) and the number of trials (x-axis) with the MegaTrials per Second

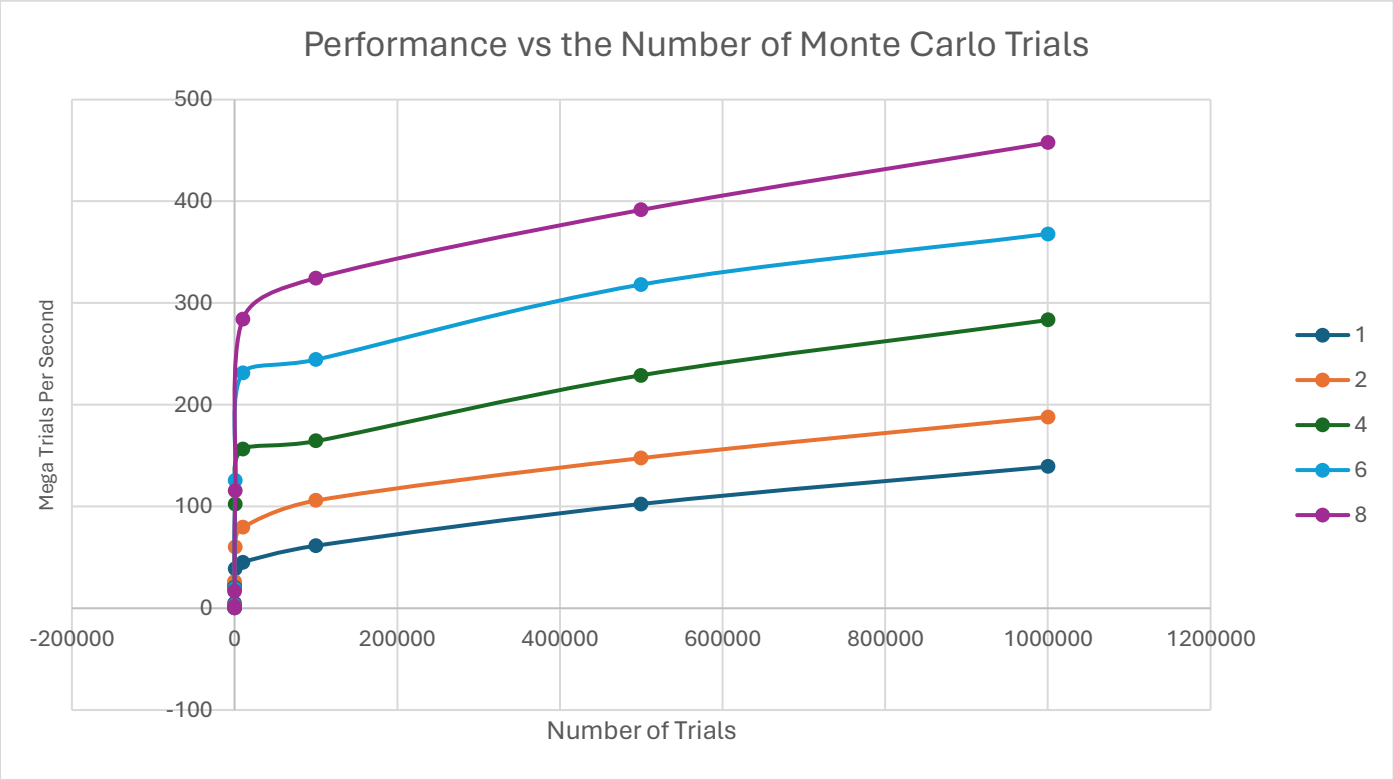

Figure 1: Scatterplot graph of Performance versus the Number of Monte Carlo Trials, graphed with the number of cores (right)

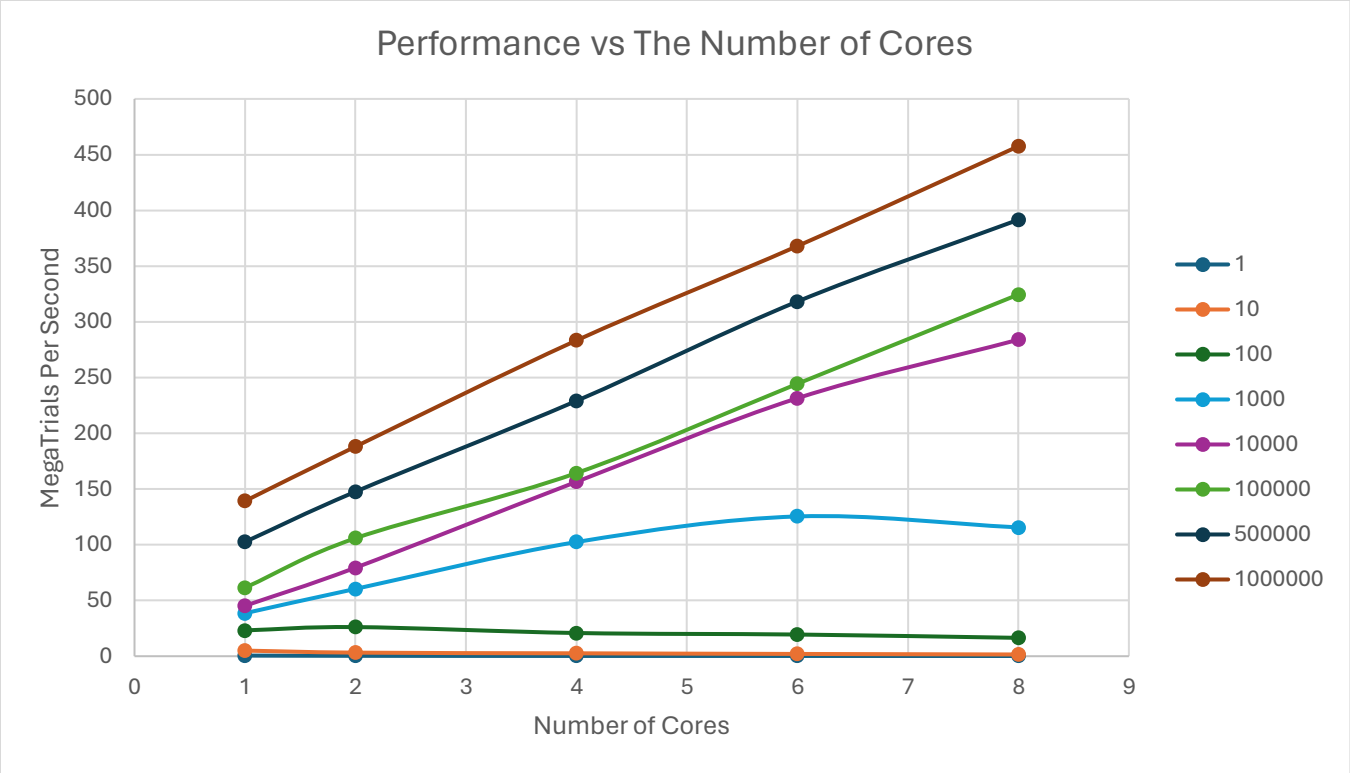

Figure 2: Scatterplot Graph that contains the number of trials based on the number of cores, graphed with the number of trials (right)

Estimated probability of a golf ball getting into the hole:

1.58% chance for a golf ball to make it into the hole with multiple golf balls heading down the slope.

Finding the Parallel Fraction

Step 1.) Find the Speed-up for 8 cores:

Performance of 8 cores for 1,000,000 trials = 457.48

Performance of 1 core for 1,000,000 trials = 139.2

457.48 / 139.2 = ~ 3.29

Step 2.) Find n/(n-1) when n is the number of cores:

8 – 1 = 7

8/7 = ~1.14

Step 3.) Find $(1 - (1/\text{Speedup}_n))$

1-(1/3.29) = ~ .696

Step 4.) Multiply 8/7 with $(1 - (1/\text{Speedup}_n))$:

(8/7) * (1-(1/3.29)) = ~.795

The parallel fraction is approximately 0.795.

Commentary

With the first Performance vs the Number of Monte Carlo Trials graph, we are able to see that the more amount of cores have a greater performance rate. This performance rate would increase massively as the trials increased from 1 to 1000 trials and would keep steadily increasing from 10,000 to one million.

However, with the results for the Performance vs The Number of Cores there wasn't too big of a difference in the beginning between 1 to 100 trials. However, there was a big difference in performance between 1000 to one million trials. That said, as the number of cores increased, it doesn't always mean an increase in performance for the number of trials. With lower trial amounts, the performance stayed the same or in some cases decreased with more cores assigned to the program.