CS 475/575 -- Spring Quarter 2025 Project #1

OpenMP: Monte Carlo Simulation

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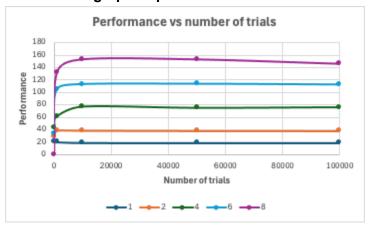
ONID: 934601450

1. Provide a close estimate of the actual probability

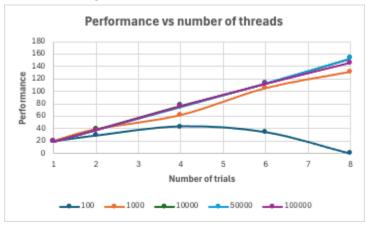
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100000 , 25.64
flip4 ~/CS575_parallel_programming/project1 178$ vim run.bash
flip4 ~/CS575_parallel_programming/project1 179$ bash run.bash
 1 threads: 100 trials; probability = 24.00%; megatrials/sec = 23.40
1 threads: 1000 trials; probability = 23.40%; megatrials/sec = 21.78
 1 threads: 1000 trials; probability = 23.40%; megatrials/sec = 21.70
1 threads: 10000 trials; probability = 23.09%; megatrials/sec = 21.14
 1 threads: 50000 trials; probability = 23.17%; megatrials/sec = 20.92
 1 threads: 100000 trials; probability = 23.15%; megatrials/sec = 20.91
 2 threads: 100 trials; probability = 24.00%; megatrials/sec = 19.78
2 threads: 1000 trials; probability = 23.40%; megatrials/sec = 11.96
2 threads: 10000 trials; probability = 23.09%; megatrials/sec = 35.18
2 threads: 50000 trials; probability = 23.17%; megatrials/sec = 41.73
 2 threads: 100000 trials; probability = 23.15%; megatrials/sec = 41.77
 4 threads: 100 trials; probability = 24.00%; megatrials/sec = 26.02
4 threads: 1000 trials; probability = 23.40%; megatrials/sec = 29.06
 4 threads: 1000 trials; probability = 23.40%; megatrials/sec = 29.06
4 threads: 10000 trials; probability = 23.09%; megatrials/sec = 32.78
4 threads: 50000 trials; probability = 23.17%; megatrials/sec = 83.85
4 threads: 100000 trials; probability = 23.15%; megatrials/sec = 83.30
 6 threads:
100 trials; probability = 24.00%; megatrials/sec = 0.07
6 threads:
1000 trials; probability = 23.40%; megatrials/sec = 0.62
6 threads:
1000 trials; probability = 23.09%; megatrials/sec = 4.02
6 threads:
50000 trials; probability = 23.17%; megatrials/sec = 19.14
6 threads:
100000 trials; probability = 23.15%; megatrials/sec = 29.23
 8 threads: 100 trials; probability = 24.00%; megatrials/sec = 0.05
8 threads: 1000 trials; probability = 23.40%; megatrials/sec = 0.37
 8 threads: 10000 trials; probability = 23.09%; megatrials/sec = 3.83
 8 threads: 50000 trials; probability = 23.17%; megatrials/sec = 18.81
 8 threads: 100000 trials; probability = 23.15%; megatrials/sec = 28.77
```

Sum of megatrials/sec Column Labels		abels											
Row Labels	1	00 1000	10000	50000	100000	Grand Total			100	1000	10000	50000	100000
	1 1	9.9 19.83	19.19	19.1	19.12	97.14		1	19.9	19.83	19.19	19.1	19.12
	2 28	76 38.72	2 38.57	38.09	37.88	182.02		2	28.76	38.72	38.57	38.09	37.88
	4 43	14 61.53	77.07	75.2	76.13	333.06		4	43.14	61.52	77.07	75.2	76.13
	6 33	87 104.69	112.75	113.28	112.09	476.68		6	33.87	104.69	112.75	113.28	112.09
	8 0	07 131.0	153.13	153.07	145.98	583.26		8	0.07	131.01	153.13	153.07	145.98
Grand Total	125	74 355.7	400.71	398.74	391.2	1672.16							

2. Good graph of performance vs. number of trials



3. Good graph of performance vs. number of threads



4. Compute Fp, the Parallel Fraction (show your work)

Speedup = 8 threads on 50000 trials / 1 thread on 50000 trials = 153.07 / 19.1 = 8.014 Fp = ((n/(n-1)) * (1 - 1/Speedup) ~= 0.9997

Parallel Fraction is 99.97%

5. Compute Smax, the Maximum Speedup

Fp = 0.9997 Smax = 1 / (1 - Fp) ~= 3333.33