Project Title : Monte Carlo Simulation(Project 1)

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- In this project, the code is run for (1,10,100,1000,10000,100000,500000,1000000,5000000,10000000) trials and (1,2,4,6,8) threads.
- For the 10000000 trials, the parallel fraction for 1 thread is inf, that for 2 threads 1.00, that for 4 threads 1.00, that for 6 threads 0.97 and that for 8 threads 0.94.
- The probability that the beam hits the plate is around 0.13. The result for running the code for the 10000000 trials is shown below.

```
NUMT = 1
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
currentProb= 0.13092540
maxPerformance for 1 Threads= 17.5324821
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
currentProb with 1 Thread= 0.13092540
maxPerformance for 1 Thread = 17.5131340
Speedup for 1 to 1 threads=     1.00
Parallel Fraction =      inf
```

```
                                       ...
NUMT = 2
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
currentProb= 0.13095920
maxPerformance for 2 Threads= 35.0101509
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
currentProb with 1 Thread= 0.13095920
maxPerformance for 1 Thread = 17.5050201
Speedup for 2 to 1 threads=     2.00
Parallel Fraction =     1.00
NUMT = 4
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
currentProb= 0.13109750
maxPerformance for 4 Threads= 69.5788803
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
currentProb with 1 Thread= 0.13109750
maxPerformance for 1 Thread = 17.3541164
Speedup for 4 to 1 threads=     4.01
Parallel Fraction =     1.00
NUMT = 6
```

```
NUMT = 6
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
currentProb= 0.13114209
maxPerformance for 6 Threads= 91.8678055
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
currentProb with 1 Thread= 0.13114209
maxPerformance for 1 Thread = 17.4834614
Speedup for 6 to 1 threads=      5.25
Parallel Fraction =      0.97
NUMT = 8
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
currentProb= 0.13108450
maxPerformance for 8 Threads= 100.8494186
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
currentProb with 1 Thread= 0.13108450
maxPerformance for 1 Thread = 17.4930077
Speedup for 8 to 1 threads=      5.77
Parallel Fraction =      0.94
flip1 ~/CS575 286$ 
```
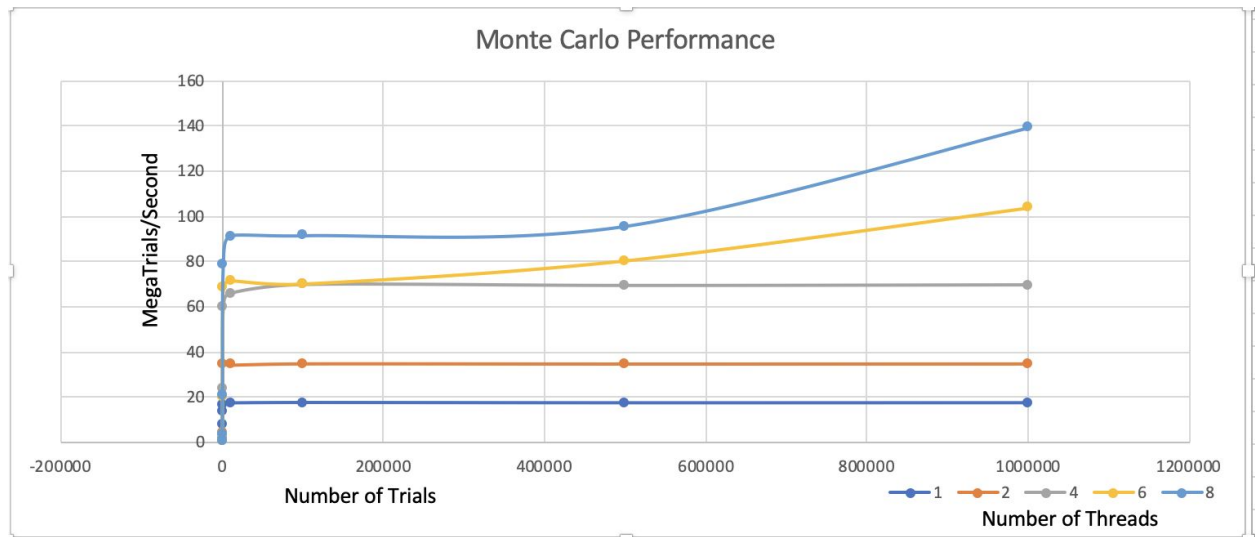
The table of the number of trials, the number of threads and the performance is given below.

Number of Trials	Number of Threads	Performance
1	1	1.124926
1	2	0.7183421
1	4	0.4757385
1	6	0.4219439
1	8	0.318665
10	1	8.0899744
10	2	4.5497537
10	4	3.9077129
10	6	3.6497004
10	8	3.2552428
100	1	13.5006676
100	2	20.1329746
100	4	23.9287281
100	6	20.5599194
100	8	20.6310272
1000	1	16.8850555
1000	2	34.6259422
1000	4	59.7120361
1000	6	68.4086304
1000	8	78.5990677
10000	1	17.3832321
10000	2	34.3873024
10000	4	66.0143661
10000	6	71.6583862
10000	8	91.3509903

Number of Trials	Number of Threads	Performance
100000	1	17.5615234
100000	2	34.9730949
100000	4	69.9248352
100000	6	70.2382278
100000	8	91.5137482
500000	1	17.4390488
500000	2	34.908989
500000	4	69.5015259
500000	6	80.5307541
500000	8	95.6778488
1000000	1	17.4622955
1000000	2	34.9413376
1000000	4	69.7668991
1000000	6	103.9736023
1000000	8	139.2975769
5000000	1	17.4477215
5000000	2	34.9171867
5000000	4	69.9440536
5000000	6	103.951622
5000000	8	117.3946686
10000000	1	17.5324821
10000000	2	35.0101509
10000000	4	69.5788803
10000000	6	91.8678055
10000000	8	100.8494186

Although the code is run for (1,10,100,1000,10000,100000,500000,1000000,5000000,10000000) trials, the graphs are drawn only for (1,10,100,1000,10000,100000,500000,1000000)trials.

The graph of performance and the number of trials

The graph of performance and number of threads