CS 575

Project #2

Numeric Integration with OpenMP Reduction

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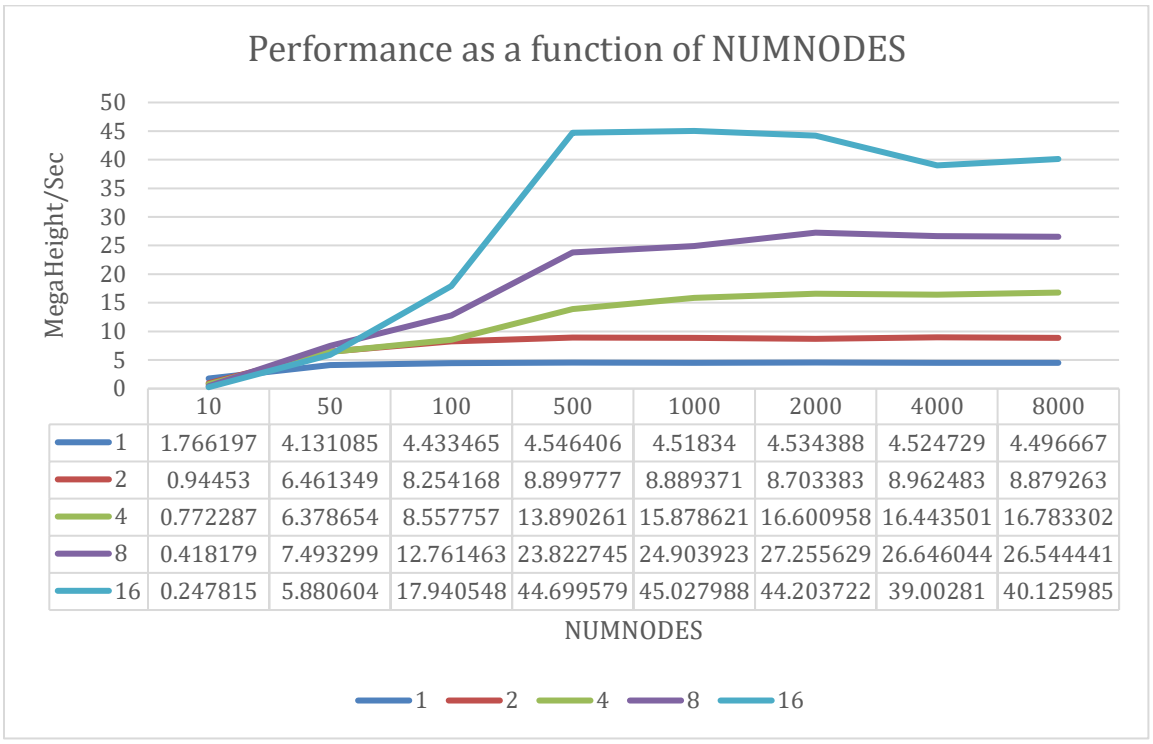
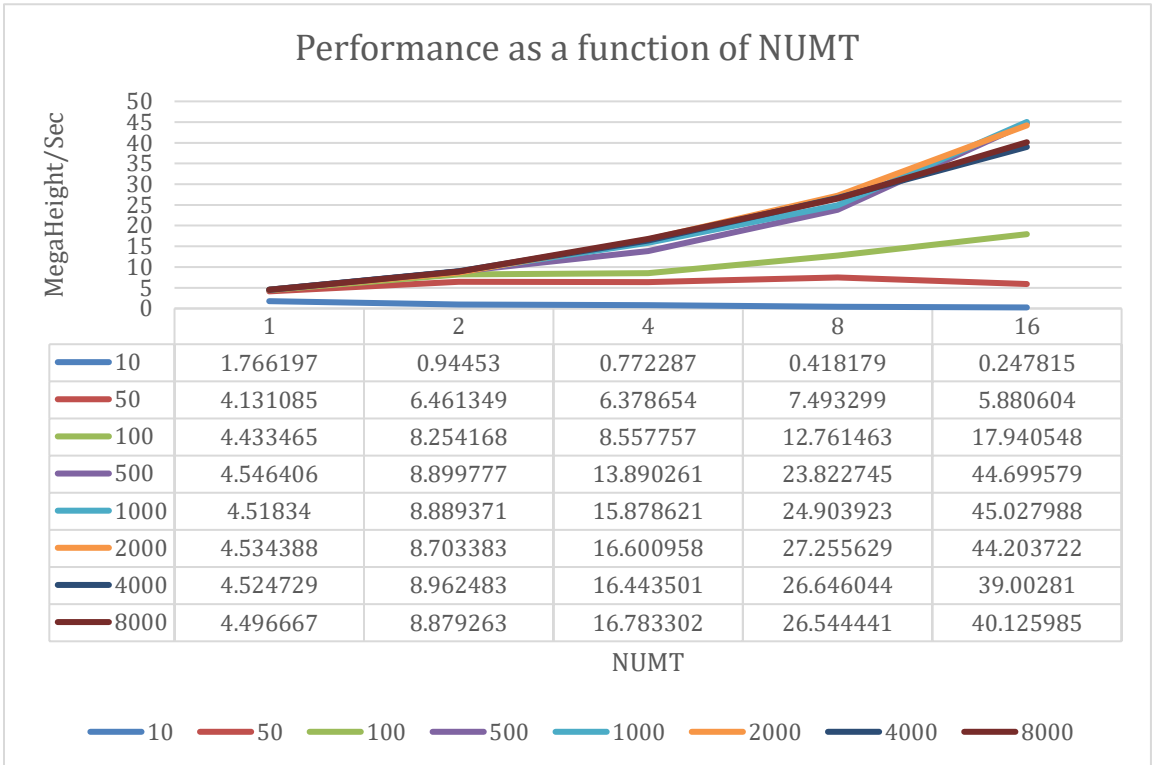
Code was run on the flip server. Got results as:



	10	50	100	500	1000	2000	4000	8000
1	1.766197	4.131085	4.433465	4.546406	4.51834	4.534388	4.524729	4.496667
2	0.94453	6.461349	8.254168	8.899777	8.889371	8.703383	8.962483	8.879263
4	0.772287	6.378654	8.557757	13.890261	15.878621	16.600958	16.443501	16.783302
8	0.418179	7.493299	12.761463	23.822745	24.903923	27.255629	26.646044	26.544441
16	0.247815	5.880604	17.940548	44.699579	45.027988	44.203722	39.00281	40.125985



	1	2	4	8	16
10	1.766197	0.94453	0.772287	0.418179	0.247815
50	4.131085	6.461349	6.378654	7.493299	5.880604
100	4.433465	8.254168	8.557757	12.761463	17.940548
500	4.546406	8.899777	13.890261	23.822745	44.699579
1000	4.51834	8.889371	15.878621	24.903923	45.027988
2000	4.534388	8.703383	16.600958	27.255629	44.203722
4000	4.524729	8.962483	16.443501	26.646044	39.00281
8000	4.496667	8.879263	16.783302	26.544441	40.125985

From observation, regardless of the number of threads, the curves of the performance all appear increased and then maintain stable. I think the curves appear increased because the workload of each thread is not saturated, and then they maintain stable since the workload is saturated.

```
16 threads , 10 Nodes : Volume = 0.382288 ;
16 threads , 50 Nodes : Volume = 0.432350 ;
16 threads , 100 Nodes : Volume = 0.434729 ;
16 threads , 500 Nodes : Volume = 0.435714 ;
16 threads , 1000 Nodes : Volume = 0.435761
16 threads , 2000 Nodes : Volume = 0.435776
```

Run the program with NUMT = 16, we got results as above. The number of threads did not affect the total volume, but the number of nodes did, which is: as the number of nodes grows, the volume is closed to 0.4358. Thus, we can estimate that the actual volume is 0.4358.

Consider # of nodes = 2000, the speed-up and the Parallel Fraction are:

# of threads	speedup	Fp=(n/n-1)(1-1/S)
2	1.919417	0.95801713
4	3.661124	0.969146479
8	6.010873	0.833634806
16	9.748553	0.897420674

Consider Fp = 0.89742, $\max Speedup = \lim_{n\to\infty} Speedup = \frac{1}{1-F_p} = 9.748489$