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CS475 – Spring 2018
Project 1

Machine

I am on my home computer, as always, running my program on the flip3 server.
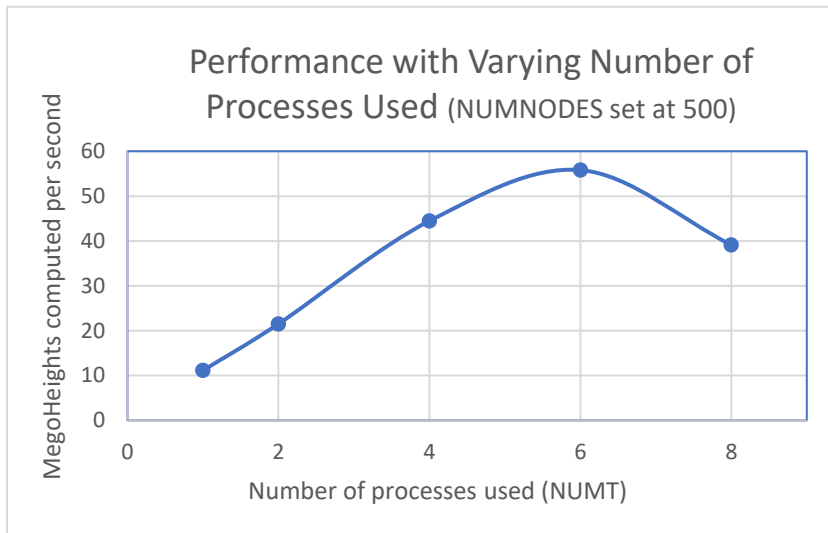
Calculated Volume

The actual volume is: 25.3125
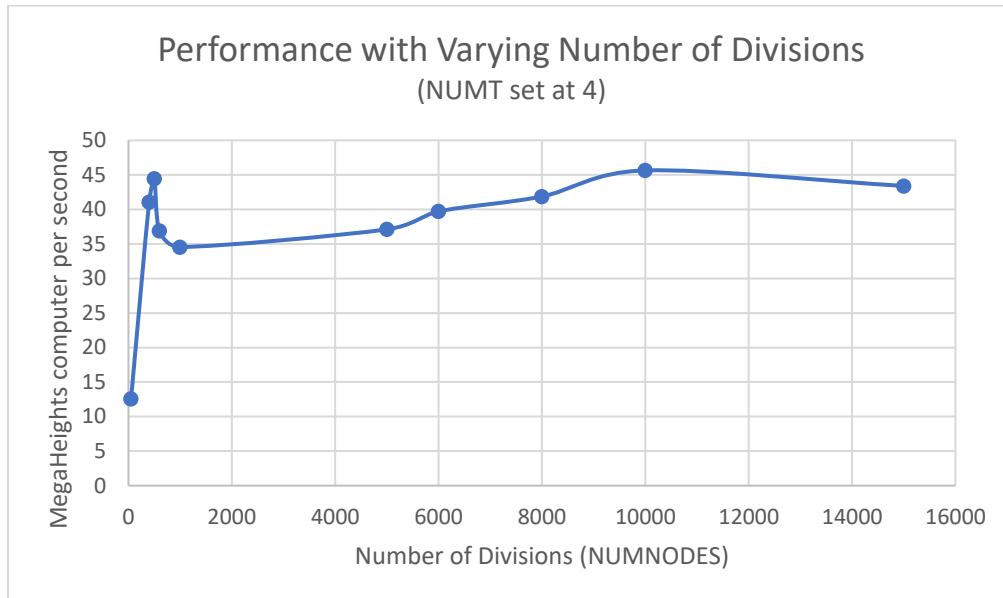
Performance

i. Varying Number of Processes

a. Graph

Performance with Varying Number of Processes Used (NUMNODES set at 500)

b. Table

Varying NUMT (NUMNODES set at 500)	
NUMT	MegaHeights/sec
1	11.1306
2	21.5089
4	44.4547
6	55.8155
8	39.133

ii.   Varying Number of Divisions
    a. Graph

Performance with Varying Number of Divisions
(NUMT set at 4)

b. Table

Varying NUMT (NUMNODES set at 500)	
NUMT	MegaHeights/sec
1	11.1306
2	21.5089
4	44.4547
6	55.8155
8	39.133

Patterns

i.   Varying Number of Processes

For the graph showing performance as a function of varying number of processes used, there is a trend that the performance/speed increases up to a certain point then decreases. For the number of processes that I chose to collect data for, NUMT = 6 was the number of process with the maximum performance.

ii.   Varying Number of Divisions

For the graph showing performance as a function of varying number of divisions, the performance rose very high very quickly with a fairly low number of divisions (500) but then performance dropped then rose again to near/slightly above the same high performance as before – in a wave type of motion.

Analysis of Behavior

i.   Varying Number of Processes

My graph is similar to the graph shown to describe Amdahl's Law except with a slight drop in performance near the end. The positive slope of the majority of the graph is expected while the drop of with the slope becoming negative is unexpected. This may have to do with the fact that I used a reduction in my program. My thinking on this is that having more than an optimal amount of processes working on the same problem with a reduction could lead to inefficiency as it would cause more "waiting around" for the processes.

ii.   Varying Number of Divisions

I am having trouble coming up for reasoning for the wave shape of this graph. One idea is that the drop in values is a fluke (though I tested several times so still hard to explain) and after about NUMNODES = 500, the performance should have leveled off near 45 megaHeights/sec or the initial high values are a fluke. This wave may also be due to the fact that a reduction was used since that sets the processes up to have to wait for one another.

Parallel Fraction

i.   Data

NUMT	MegaHeights/sec	Speedup	fp	Volume	max speedup
1	11.1306	N/A		25.3125	
2	21.5089	1.9324	0.965	25.3125	28
4	44.4547	3.9939	0.9995	25.3125	2000
6	55.8155	5.0146	0.9607	25.3125	25.4453
8	39.133	3.5158	0.8178	25.3125	5.4885

ii.   Analysis

From the data shown above, it seems that the Parallel Fraction for this application is 0.9995.

Maximum Speedup

From the Parallel Fraction, the maximum speed-up this application could EVER achieve is 2000.