CS475: Project 2

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April 28, 2015

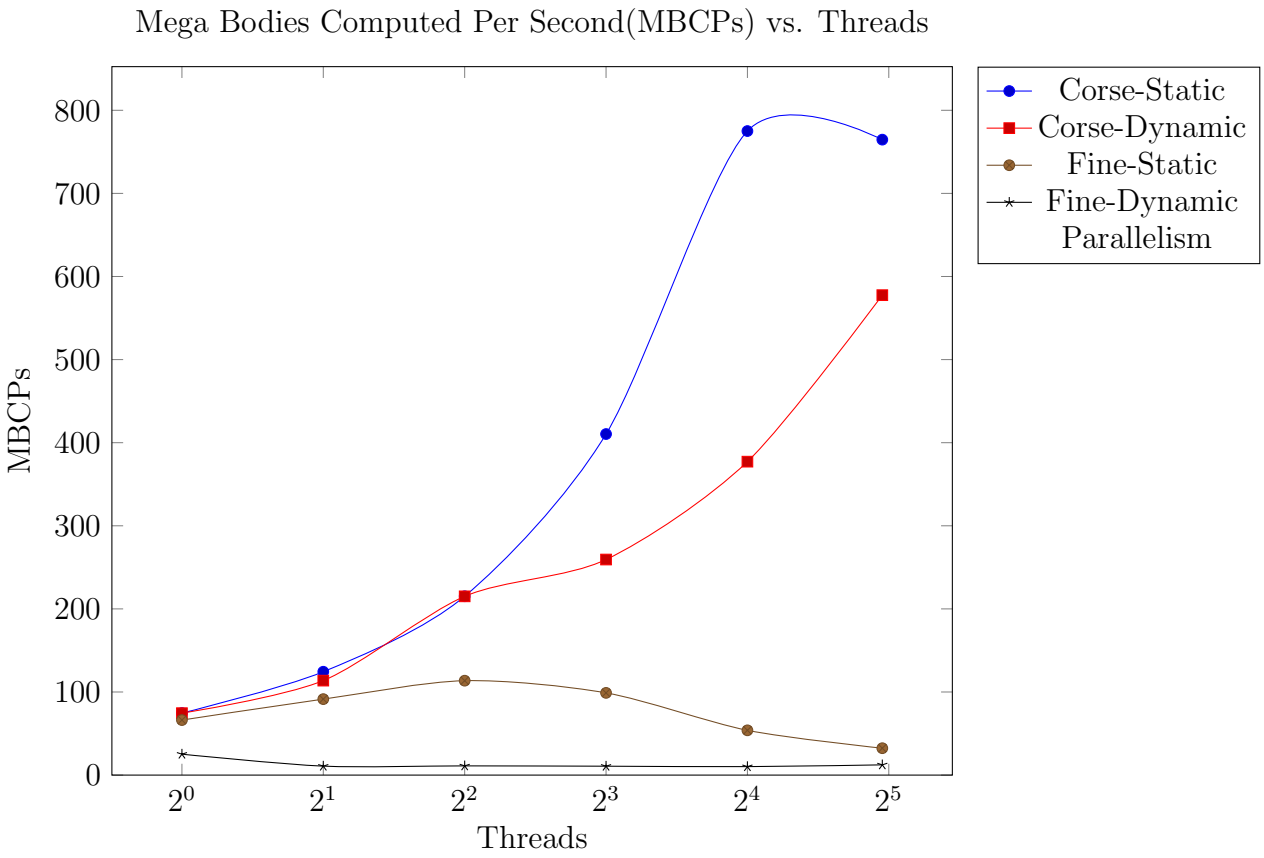
N-Bodies

This project involved comparing the parallel performance of corse-grained, fine-grained, static scheduling, and dynamic scheduling for running an N-body simulation using the OpenMP library.

The program was compiled using *gcc* and ran on the *rabbit.engr.oregonstate.edu* Xeon processor with 32 CPUs (not the Phi). It used the following combination of parameters:

- Number of Bodies: 1024
- Number of Steps: 512
- Threads:
  - 1
  - 2
  - 4
  - 8
  - 16
  - 31
  - 32

Graph



Patterns

Between Corse and Fine grained parallelism, the data show corse peforming much better. This is most likely do to the overhead of assigning too little work to each thread. For fine-grained parallelism, instead of working on an entire row of bodies, each thread only works on one at a time.

The data shows static scheduling performs much better than dynamic for both corse and fine grained parallelism.

Performance increases tremendously between 8 and 16 threads, and I believe this is because the program starts taking advantage of having full memory

cache lines.

Sadly, there was not enough time to finish computation for the 32 threads. I have a strong feeling this means that performance at 32 threads or greater is abysmal.

Tables

NUMBODIES	NUMSTEPS	NUMT	MBCPs	TIME
1024	512	1	74.6401	7.1928s
1024	512	2	124.384	4.31625s
1024	512	4	215.213	2.4946s
1024	512	8	410.414	1.30812s
1024	512	16	775.018	0.692721s
1024	512	31	764.676	0.702089s

Table 1: Corse-Static

NUMBODIES	NUMSTEPS	NUMT	MBCPs	TIME
1024	512	1	74.5215	7.20425s
1024	512	2	113.695	4.72202s
1024	512	4	215.108	2.49582s
1024	512	8	259.401	2.06966s
1024	512	16	377.182	1.42338s
1024	512	31	577.534	0.929592s

Table 2: Corse-Dynamic

NUMBODIES	NUMSTEPS	NUMT	MBCPs	TIME
1024	512	1	66.2144	8.10806s
1024	512	2	91.421	5.87251s
1024	512	4	113.604	4.72579s
1024	512	8	98.9307	5.42674s
1024	512	16	53.8744	9.96523s
1024	512	31	32.3606	16.5902s

Table 3: Fine-Static

NUMBODIES	NUMSTEPS	NUMT	MBCPs	TIME
1024	512	1	25.1711	21.3288s
1024	512	2	10.7805	49.8003s
1024	512	4	11.0897	48.4117s
1024	512	8	10.7054	50.1495s
1024	512	16	10.1968	52.651s
1024	512	31	12.3258	43.5565s

Table 4: Fine-Dynamic