Concurrency & Parallel Programming

CUDA

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1 Assignment 6.1 - Wave simulation

2 Results

Table 1: Calculation times of the CUDA driven wave simulation in ms using a t_max of 1000.

t_max = 1000, 512 threads per block				
i=1e3	i=1e4	i=1e5	i=1e6	i=1e7
4,95	5,05	4,94	3,36	3,32
3,41	3,57	3,32	3,35	3,31
3,42	3,54	3,34	3,36	3,3
4,91	5,05	3,24	3,35	3,31
3,49	3,47	3,3	3,37	3,3
4,91	3,49	3,34	3,36	3,31
4,91	3,5	4,89	3,41	3,32
4,93	5,02	4,94	3,37	3,3
3,46	5,06	4,95	3,38	3,31
4,93	5,01	4,92	3,34	3,3
Average over 10 runs:				
4,332	4,276	4,118	3,365	3,308

Table 2: Calculation times of the CUDA driven wave simulation in μs using a t_max of 100.

t_max = 100, 512 threads per block				
529	555	374	392	399
391	383	373	397	406
534	554	367	405	396
530	397	541	391	574
539	540	542	403	395
388	395	373	396	383
538	384	542	404	383
379	387	538	396	399
382	554	379	395	392
527	545	375	590	386
Average over 10 runs:				
473,7	469,4	440,4	416,9	411,3

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2.1 Speed comparison

Table 3: Speed comparison between pthreads, MPI, openMP and CUDA, t_max = 1000, i_max = 1e6.

Method	Average time (ms)	CUDA speedup
CUDA - 512 threads per block	3,365	1.0
MPI - 8 nodes with 8 processes each	120.140	35.703
MPI - 8 nodes with 1 process each	495.634	147.291
OpenMP - 8 threads - static scheduler	661.320	196.529
pThreads - 8 threads	677.751	201.412
MPI - 1 node 8 processes	1186.726	352.667
pThreads -1 thread / Sequential	3788.914	1125.977

2.2 Block sizes

2.3 Results comparison

3 Assignment 6.2 - Parallel reduction