Introduction to Cuda Parallel Programming Homework Assignment 3

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Disscusion

Problem 1

From figure 1, we can see that with the block size increase, we save more time on computation when the lattice size is large. On the other hand, in figure 2, when the lattice size is 32x32, the increasing in block size has no advantage. On top of that, in table 1, the cpu can easily beat gpu when the lattice is small.

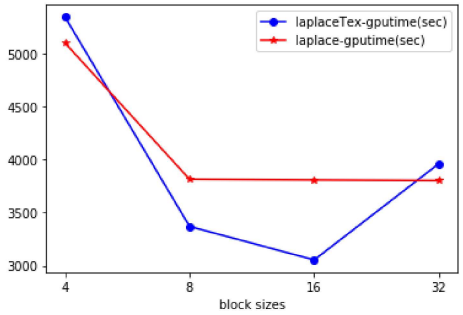

figure 1: gpu time with block size increase when lattice sizes is 256x256

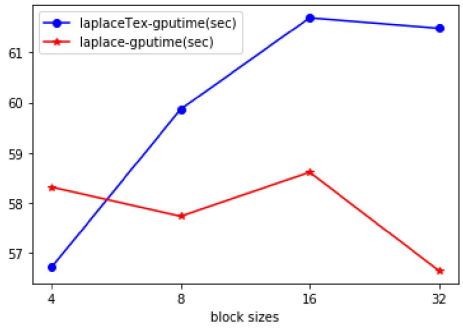

figure 2: gpu time with block size increase when lattice sizes is 32x32

lattice_sizes	block sizes	gputime	gputime_tot	diff	cputime	savetime
32x32	4x4	56.712	57.0001	0	10.5568	0.185206
32x32	8x8	59.8652	60.1353	0	10.5648	0.175684
32x32	16x16	61.6903	61.9592	0	10.5487	0.170253
32x32	32x32	61.4821	61.75	0	10.5666	0.171119

table 1: gpu time with different block sizes

tags: `NTU` `Homework` `cuda`

Problem 2

In table 2 and table 3, we could roughly say that the larger block size enhance the perfomance. However, the texture memory didn't have any advantage in this case is really beyond my expectation. The optimal block size seems to be 128x128 in both cases.

lattice_sizes	block sizes	gputime	gputime_tot	diff	cputime	savetime
512x512	64x64	0.045056	3.02278	0	915702	302933
512x512	128x128	0.037056	2.2681	0	915702	302933
512x512	256x256	0.03808	2.30298	0	915702	302933
512x512	512x512	0.037952	2.31798	0	915702	302933

table 2: running time using gpu with texture memory with different block sizes

lattice_sizes	block sizes	gputime	gputime_tot	diff	cputime	savetime
512x512	64x64	0.04592	2.39827	0	975479	406742
512x512	128x128	0.029184	2.01072	0	975479	406742
512x512	256x256	0.029184	2.05885	0	975479	406742
512x512	512x512	0.028928	2.04144	0	975479	406742

table 3: gpu time with different block sizes

Problem 3

In prolem 3, we implemented a 3D laplace eqution solver, and from table 4 we can see that with the block size increase we can have much better performance.

lattice_sizes	block sizes	gputime	gputime_tot	cputime	savetime
32x32	4x4	75.4669	75.9395	477.408	6.2867
32x32	8x8	82.1287	82.5419	478.343	5.7951
32x32	16x16	0.02912	0.44422	478.258	1076.6
32x32	32x32	0.03776	0.45561	477.305	1047.6
64x64	4x4	764.966	766.784	14622.9	19.070
64x64	8x8	746.02	747.807	14599.9	19.523
64x64	16x16	0.03788	2.10522	14598.6	6934.5
64x64	32x32	0.03734	2.11651	14599.1	6897.7
128x128	4x4	16422.4	16430.1	498718	30.353
128x128	8x8	15354.1	15361.7	473625	30.831
128x128	16x16	0.03996	7.81018	473537	60630
128x128	32x32	0.04150	7.88112	473621	60095

table 4: gpu time with different block sizes