Advanced Computer Architecture (ACA)

GPU (CUDA) Vector Reduction

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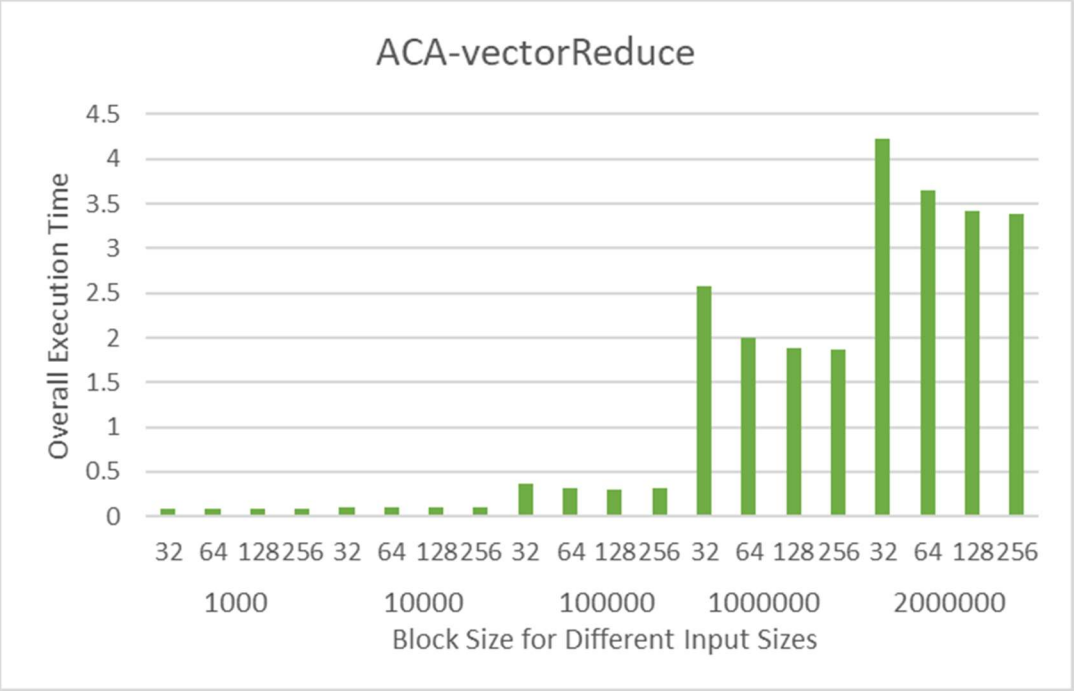
[Item 1]: The .cu file is attached with this document.

[Item 2]: The execution time and memory transfer times.

Input Size	Blocksize	GPU Execution Time (ms)	Memory Transfer Time (ms)	CPU Time (to add partial sums) (ms)	Overall Execution Time (ms)
1000	32	0.038	0.04	0	0.079
10000	32	0.042	0.058	0.001	0.102
100000	32	0.137	0.217	0.006	0.36
1000000	32	0.651	1.875	0.05	2.576
2000000	32	1.083	3.056	0.095	4.234
1000	64	0.038	0.048	0	0.086
10000	64	0.04	0.058	0.001	0.099
100000	64	0.118	0.198	0.002	0.319
1000000	64	0.445	1.534	0.025	2.004
2000000	64	0.671	2.928	0.05	3.65
1000	128	0.038	0.041	0.001	0.08
10000	128	0.039	0.059	0	0.098
100000	128	0.112	0.194	0.002	0.308
1000000	128	0.368	1.505	0.012	1.885
2000000	128	0.511	2.874	0.026	3.411
1000	256	0.039	0.042	0	0.081
10000	256	0.039	0.057	0	0.097
100000	256	0.113	0.195	0.001	0.31
1000000	256	0.382	1.48	0.006	1.868
2000000	256	0.542	2.827	0.012	3.381

[Item 3]: Graph the result using Excel or any plotting tool, clearly showing the overall execution time versus Input Size and Block Size.



[Item 4]:

Input Size	Blocksize	Previous total execution (CPU+GPU) (ms)	Total execution (atomic support in GPU) (ms)	Speedup (percentage)
1000	32	0.079	0.079	0
10000	32	0.102	0.099	2.941
100000	32	0.36	0.343	4.722
1000000	32	2.576	2.157	16.265
2000000	32	4.234	4.005	5.408
1000	64	0.086	0.079	8.139
10000	64	0.099	0.1	2.020
100000	64	0.319	0.316	0.940
1000000	64	2.004	1.933	3.542
2000000	64	3.65	3.501	4.082
1000	128	0.08	0.081	1.25
10000	128	0.098	0.097	1.020
100000	128	0.308	0.307	0.324
1000000	128	1.885	1.847	2.015
2000000	128	3.411	3.304	3.136
1000	256	0.081	0.08	1.234
10000	256	0.097	0.096	1.030
100000	256	0.31	0.314	3.225
1000000	256	1.868	1.823	2.408
2000000	256	3.381	3.27	3.283

[Item 5]:

Input Size	GPU Overall Execution Time (blocksize=32) with the if statement present (ms)	GPU Overall Execution Time (blocksize=32) without the if statement present (ms)	Percentage different in performance
1024	0.08	0.079	1.25%
4096	0.088	0.088	0%
16384	0.115	0.115	0%
262144	0.804	0.797	0.87%
1048576	2.3	2.296	0.173%