HW2 Report

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1. Description

Under the "b10505047_HW2" directory, my source code is in vecTrace.cu, and the results that I tested are put under the "results" directory. There are total 6 files Output_32, Output_64, …, Output_1024. The numbers in files' names represents the block size 32, 64, …, 1024. Each file is tested with some different grid sizes. To run the code, run "make" first and then run "condor_submit cmd" to submit the job. Go to the "cmd" file, then you can change "Initialdir" into your working directory and "Arguments" into different input and output files' names.

2. Results

I mainly tested block size = 32, 64, 128, 256, 512, 1024, each with several combinations of grid sizes. The optimal block size and grid size that I tested is block size = 1024 with grid size = 512. I tested each input case for several times for a more reliable result, and each test has $|(h\_G - h\_D)/h\_D| < 1e-4$, which assuring a reliable answer. The table below shows the total time for GPU(ms) of each test case.

grid size ⟶ block size	1024	512	256	128	64	32
32	58.385025	57.152737	55.525826	59.100418	61.829216	75.652641
64	55.435165	55.413921	55.406494	57.364223	58.931423	64.162788
128	55.841373	55.402721	55.112190	55.379265	57.328224	60.409760
256	56.026978	55.719009	55.546303	55.265377	56.641762	56.443169
512	55.662403	55.780254	55.344093	55.519650	55.438431	55.836098
1024	55.630722	52.683201	55.169502	55.079521	54.135868	55.630974

3. Discussion

According to the results that I tested, I discovered that for block size < 32, the results are far worse, which means that block size should not be too small. The six block sizes that I tested perform similar in most cases. However, block size = 1024 performs slightly better than the others. Therefore, I regarded it as the optimal block size, and it performs the best with grid size = 512.

Speaking of grid size, first I tried to use the formula blocksPerGrid = (N + threadsPerBlock - 1) / threadsPerBlock. However, the total time for GPU was too large, so then I tested grid size = 1024 and decrease from this number. For most of the cases, grid size = 1024, 512, 256 have similar performance. As for grid size < 128, the total time for GPU mostly became large again.