

Introduction to Cuda Parallel Programming Homework Assignment 2

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Discussion

In this homework, we implemented the parallel reduction to find the maximum number in an array. Also, we use different block size and grid size in our experiments to do the optimization. In **table 1**, it shows that with both the block size and grid size increase we can reduce the time for computation.

However, we also care about the accuracy of our computation. From **figure 1** and **figure 2**, we can see that the error is becoming larger when block size and grid size increase. Therefore, the optimal parameters for this problem would be around (block size, grid size) = (2⁶⁴, 10⁴) .

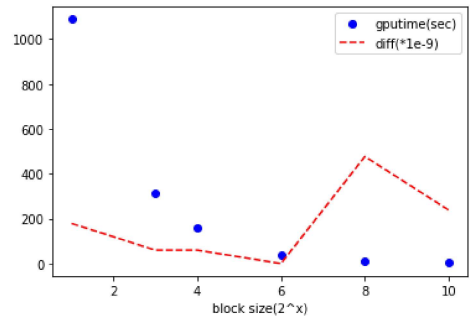


figure 1: gpu time and error with block size increase

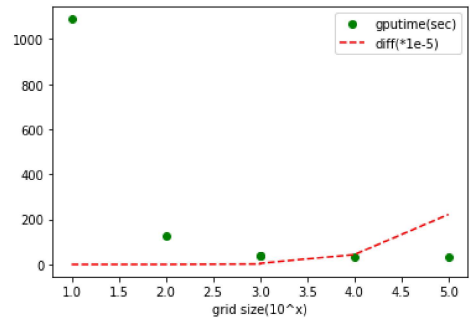


figure 2: gpu time and error with grid size increase

tags: NTU Homework

| block size | grid size | gputime | diff | speedup |
|------------|-----------|---------|-------------|----------|
| 2 | 10 | 1089.41 | 1.79E-07 | 0.374051 |
| 2 | 100 | 125.814 | 1.13E-06 | 2.28305 |
| 2 | 1000 | 38.3184 | 1.91E-05 | 4.27015 |
| 2 | 1000 | 38.3306 | 4.68E-05 | 4.27145 |
| 2 | 10000 | 32.2284 | 0.000432909 | 4.54477 |
| 2 | 100000 | 32.2092 | 0.00222009 | 4.53108 |
| 8 | 10 | 313.228 | 5.96E-08 | 1.14616 |
| 8 | 100 | 32.1578 | 5.36E-06 | 4.57068 |
| 8 | 1000 | 10.9708 | 2.59E-05 | 5.84744 |
| 8 | 1000 | 10.947 | 5.96E-06 | 5.87766 |
| 8 | 10000 | 9.39043 | 0.000388563 | 5.94373 |
| 8 | 100000 | 9.89571 | 0.00355327 | 5.9401 |
| 16 | 10 | 161.367 | 5.96E-08 | 1.92233 |
| 16 | 100 | 16.1812 | 2.09E-06 | 5.4769 |
| 16 | 1000 | 5.59347 | 1.97E-06 | 6.32402 |
| 16 | 1000 | 5.58077 | 2.52E-05 | 6.30902 |
| 16 | 10000 | 4.81322 | 0.000424623 | 6.36728 |
| 16 | 100000 | 4.73104 | 0.00453991 | 6.384 |
| 64 | 10 | 40.3239 | 0 | 4.20245 |
| 64 | 100 | 4.41235 | 8.94E-07 | 6.41512 |
| 64 | 1000 | 2.38614 | 2.09E-05 | 6.5316 |
| 64 | 1000 | 2.38202 | 2.59E-05 | 6.62187 |
| 64 | 10000 | 2.2881 | 0.0001688 | 6.61926 |
| 64 | 100000 | 2.20038 | 0.00146359 | 6.66197 |
| 256 | 10 | 10.1169 | 4.77E-07 | 5.88996 |
| 256 | 100 | 2.24086 | 7.15E-07 | 6.60292 |
| 256 | 1000 | 2.27965 | 7.69E-06 | 6.60592 |
| 256 | 1000 | 2.2809 | 9.36E-06 | 6.6138 |
| 256 | 10000 | 2.22125 | 6.05E-05 | 6.67733 |
| 256 | 100000 | 3.2655 | 0.00499916 | 6.51829 |
| 1024 | 10 | 2.99923 | 2.38E-07 | 6.56726 |
| 1024 | 100 | 2.24586 | 2.15E-06 | 6.63229 |
| 1024 | 1000 | 2.26922 | 3.70E-05 | 6.65092 |
| 1024 | 1000 | 2.27018 | 6.56E-07 | 6.6149 |
| 1024 | 10000 | 2.65533 | 0.000142515 | 6.59369 |
| 1024 | 100000 | 17.7644 | 0.000217199 | 5.35461 |

table 1: results in different setting