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Merge Sort CUDA

Run the Program:

1. Navigate to the project folder.
2. Type ‘make’ into the command prompt and hit ‘Enter’.
3. The project should compile and create .o files.
4. Type ‘./project <arraySize>’ into the command prompt and hit ‘Enter’ to run the program.
5. Optional: Type ‘p’ after the array size to print output arrays to the console.
6. Type ‘diff <file1> <file2>’ to print the differences between the CPU and GPU output.
7. The files will be populated and in the project folder after the first execution.

Purpose:

1. ‘./project’ – Calls the executable to run the program
2. ‘<arraySize>’ – Gives the user the ability to specify data size. Also helps with capturing program performance of larger data sets.
3. ‘p’ – Prints program output to the console. This makes the difference between CPU and GPU output, with smaller data sets, easier to understand and debug.
4. ‘diff <file1> <file2>’ – Assists with the debugging of code and correct capture of output.

         b)  provide at least one sample run for your CPU implementation and at least one sample run for your GPU implementation using screenshots. The **screenshots** display the command used to run your program and the output results from your program. Please also include **screenshots** that prove the results of your CPU implementation match that of your GPU implementation.

         c) provide GPU speedup compared with pure CPU implementation using dataset of **various size**. You have to provide a **speedup** tabular chart for different input size.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Input size | 2,048 | 1,048,576 | 8,388,608 | 16,777,216 | 33,554,432 |
| Block Dimensions | 1 x 512 | 1 x 512 | 1 x 512 | 1 x 512 | 1 x 512 |
| T1:time cost for GPU (sec) | .000675 | .627788 | 4.715045 | 9.442738 | 18.891363 |
| T2:time cost for CPU (sec) | .001092 | .164468 | 1.427419 | 2.888026 | 5.982103 |
| Speedup = T2 / T1 | 1.6178 | .26198 | .30273 | .30584 | .31665 |

Times with offloading the last merge onto the CPU

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Input size | 2,048 | 1,048,576 | 8,388,608 | 16,777,216 | 33,554,432 |
| Block Dimensions | 1 x 512 | 1 x 512 | 1 x 512 | 1 x 512 | 1 x 512 |
| T1:time cost for GPU (sec) | .000023 | .326090 | 2.393490 | 4.790324 | 9.567669 |
| T2:time cost for CPU (sec) | .000266 | .159490 | 1.409835 | 2.910260 | 5.932908 |
| Speedup = T2 / T1 |  |  |  |  |  |