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Merge Sort CUDA (Naïve/Binary Search)

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.
 - a. Optional: Type 'p' after the array size to print output arrays to the console.
- 5) Type 'diff <file1> <file2>' to print the differences between the CPU and GPU output.
 - a. 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.

c) Speedups of Merge Sort

- Times with not offloading last merge onto 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)	.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 last merge onto 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	11.565	.48909	.58902	.60752	.30654