CS610: Programming for Performance
Assignment 4

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1 Problem 1

1.1 Compilation command

```
nvcc -ccbin /usr/bin/g++-10 -lineinfo -res-usage -arch=sm_80 -std=c++11 190997-prob1.cu
-o 190997-prob1
```

1.2 Performance

I used NVIDIA Nsight Compute to profile the kernels. The results are given below. The times are in microseconds.

Stencil time on CPU: 4215

Naive CUDA kernel time: 10.56

Shared memory tiling (block size = 1): 17.12

Shared memory tiling (block size = 2): 12.13

Shared memory tiling (block size = 4): 10.34

Shared memory tiling (block size = 8): 11.68

Pinned memory: 11.84

Unified virtual memory: 12.06

1.3 Summary

Shared memory tiling with a block size of 4 had the best performance with a speedup of 4215 / 10.34 = 407.64

2 Problem 2

2.1 Compilation command

```
nvcc -ccbin /usr/bin/g++-10 -lineinfo -res-usage -arch=sm_80 -std=c++14 190997-prob2.cu
-o 190997-prob2
```