A1 Report

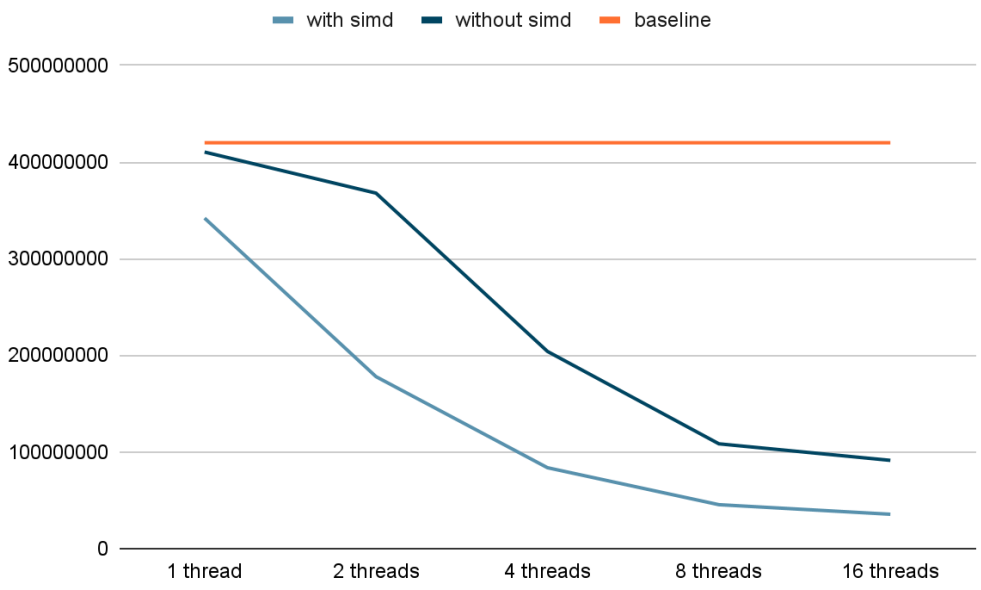
Yezheng Shao

Method:

The first attempt is to parallelize the calculation by multithread. Since each data point is calculated independently, we can reorder the calculation steps and split the graph into n (the number of threads) sections. Each thread works in separate sections. By applying this method, a speed-up of 5x has been achieved on 16 threads on 64 scanlines data.

The second attempt is to apply SIMD. SIMD causes significantly fewer instruction calls. In addition to the parallelization, each thread can calculate 4 data points together by vectorization.

Scalability:



Discussion:

16 threads perform the best, however, it only has a small speed-up compared to 8 threads. Without SIMD, 2 threads compare to 1 thread only have a small improvement. This may be because both threads are running on the same core.
In both scenarios, parallelization doesn't provide a linear speed-up. The speed-up slows down as the number of threads increases. With SIMD, an approximately 11x speed-up has been achieved. I was expecting an approximate additional 4x speed-up by applying SIMD, however, it only speed-up about 2.5x in 16 threads.