

Parallel Algorithm Design Report 2
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The input image is 20000 pixel x 20000 pixel, 900 pixel/in resolution image.

Input image size: 1.2GB

Running machine specification:

- Processor: AMD® Ryzen threadripper 1950x 16-core processor × 32
- Graphics: GeForce GTX 1080 Ti/PCIe/SSE2
- Memory: 125.9 GiB
- Number of physical cores: 16
- Number of virtual cores: 32

Running result

of processors: 32

Elapsed time with 1 threads 3100.91 [ms]
Elapsed time with 2 threads 1635.53 [ms]
Elapsed time with 3 threads 1046.4 [ms]
Elapsed time with 4 threads 882.925 [ms]
Elapsed time with 5 threads 750.995 [ms]
Elapsed time with 6 threads 650.206 [ms]
Elapsed time with 7 threads 538.008 [ms]
Elapsed time with 8 threads 435.183 [ms]
Elapsed time with 9 threads 405.797 [ms]
Elapsed time with 10 threads 369.163 [ms]
Elapsed time with 11 threads 371.498 [ms]
Elapsed time with 12 threads 326.905 [ms]
Elapsed time with 13 threads 283.057 [ms]
Elapsed time with 14 threads 252.975 [ms]
Elapsed time with 15 threads 258.259 [ms]
Elapsed time with 16 threads 244.534 [ms]
Elapsed time with 17 threads 233.275 [ms]
Elapsed time with 18 threads 216.513 [ms]
Elapsed time with 19 threads 200.162 [ms]
Elapsed time with 20 threads 176.676 [ms]
Elapsed time with 21 threads 177.449 [ms]
Elapsed time with 22 threads 190.226 [ms]
Elapsed time with 23 threads 175.126 [ms]
Elapsed time with 24 threads 170.136 [ms]
Elapsed time with 25 threads 162.142 [ms]
Elapsed time with 26 threads 131.755 [ms]
Elapsed time with 27 threads 131.011 [ms]
Elapsed time with 28 threads 129.298 [ms]
Elapsed time with 29 threads 130.52 [ms]
Elapsed time with 30 threads 131.455 [ms]

Elapsed time with 31 threads 125.424 [ms]
Elapsed time with 32 threads 129.367 [ms]
Elapsed time with 33 threads 136.15 [ms]
Elapsed time with 34 threads 142.449 [ms]
Elapsed time with 35 threads 126.34 [ms]
Elapsed time with 36 threads 138.444 [ms]
Elapsed time with 37 threads 137.074 [ms]
Elapsed time with 38 threads 135.784 [ms]
Elapsed time with 39 threads 146.195 [ms]
Elapsed time with 40 threads 131.094 [ms]
Elapsed time with 41 threads 133.674 [ms]
Elapsed time with 42 threads 125.006 [ms]
Elapsed time with 43 threads 131.299 [ms]
Elapsed time with 44 threads 126.892 [ms]
Elapsed time with 45 threads 126.484 [ms]
Elapsed time with 46 threads 120.416 [ms]
Elapsed time with 47 threads 128.667 [ms]
Elapsed time with 48 threads 128.054 [ms]
Elapsed time with 49 threads 137.048 [ms]
Elapsed time with 50 threads 125.44 [ms]
Elapsed time with 51 threads 128.668 [ms]
Elapsed time with 52 threads 128.04 [ms]
Elapsed time with 53 threads 126.279 [ms]
Elapsed time with 54 threads 119.337 [ms]
Elapsed time with 55 threads 129.1 [ms]
Elapsed time with 56 threads 121.351 [ms]
Elapsed time with 57 threads 126.424 [ms]
Elapsed time with 58 threads 125.737 [ms]
Elapsed time with 59 threads 135.127 [ms]
Elapsed time with 60 threads 122.639 [ms]
Elapsed time with 61 threads 126.075 [ms]
Elapsed time with 62 threads 129.425 [ms]
Elapsed time with 63 threads 125.64 [ms]

Discussion and summary charts:

Running time

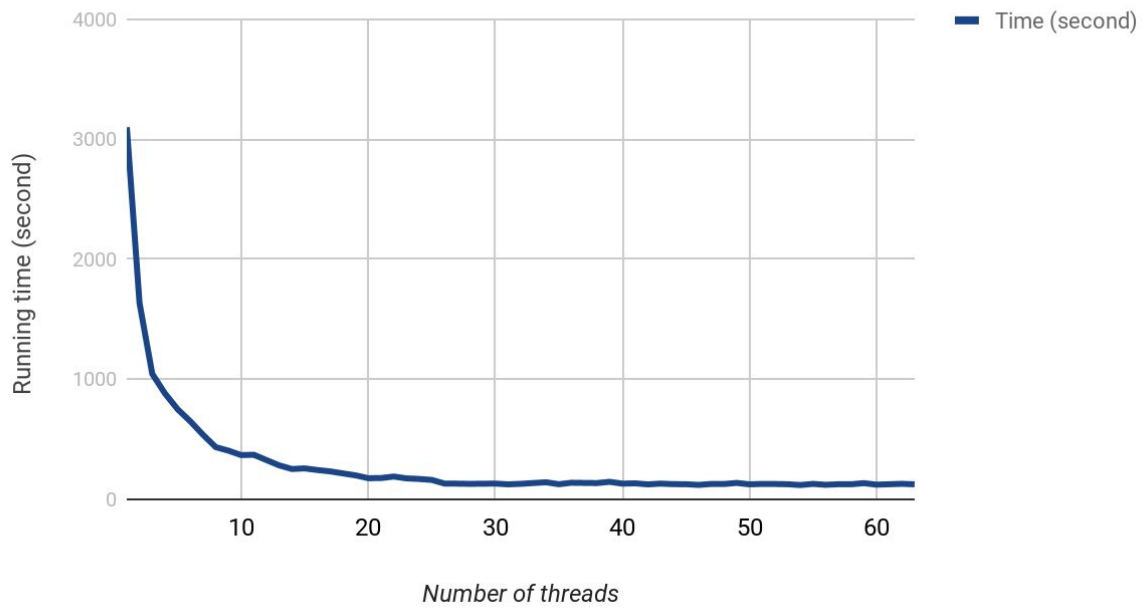


Figure 1: Running time of program with 1-> 64 threads

Running time

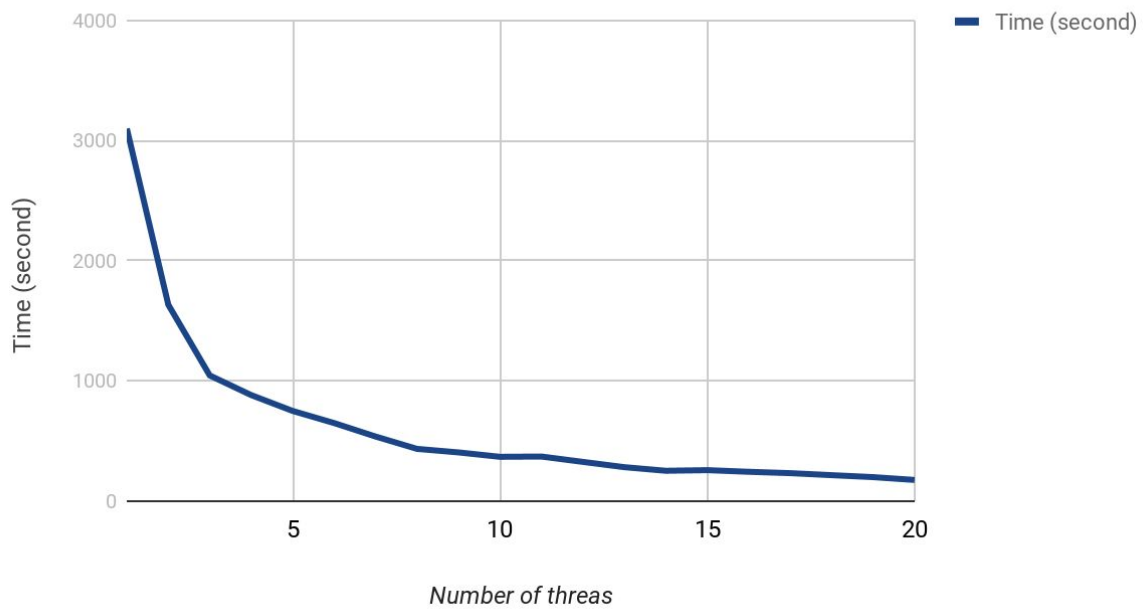


Figure 2: zoomed in version of figure 2. Threads: 1->20

Acceleration rate

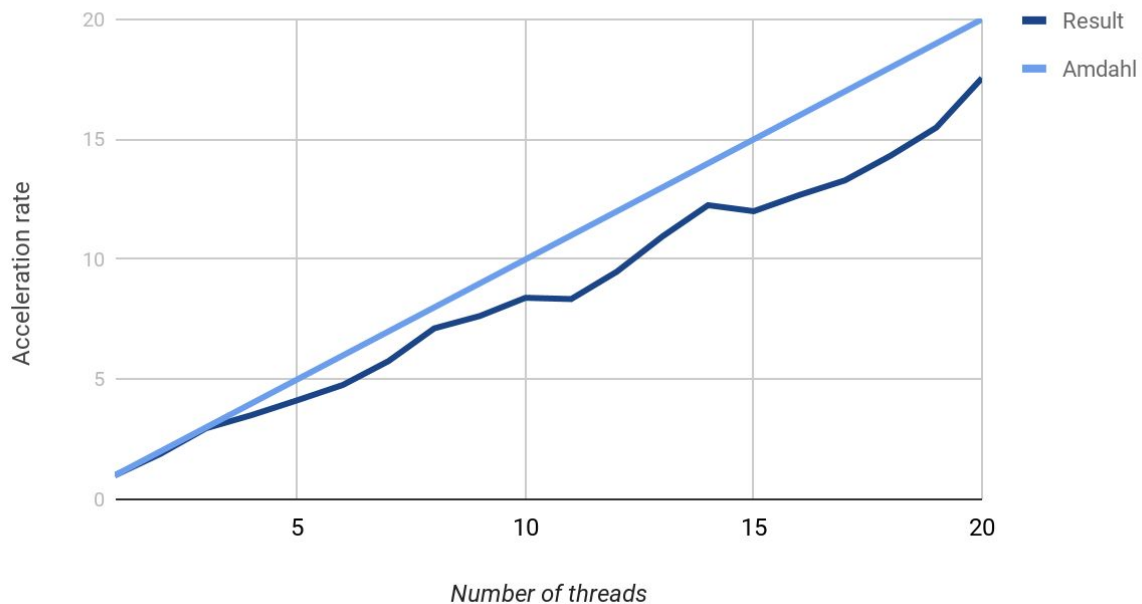


Figure 3: acceleration rate compared with ideal Amdahl law bound

Ratio of parallel part in parallelized program: 100%

Due to Amdahl law, speed-up rate with N processes is bounded by $1/((1-P) + P / N) = N$ times. Figure 3 shows that the result is always lower than Amdahl value.

From Figure 1, running time is generally shorter when increasing number of threads.

Why is time runned with 15, 16 threads longer than with 14 threads?

Because, Running machine has 16 physical cores, 2 threads are used by OS and other tasks.

This also explains that executing program with more than 16 cores does not speed-up too much.

Figure 3 shows that the more cores used the nearer speed-up result reaches Amdahl value