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CSE 160: Parallel Computing
Programming Assignment #6
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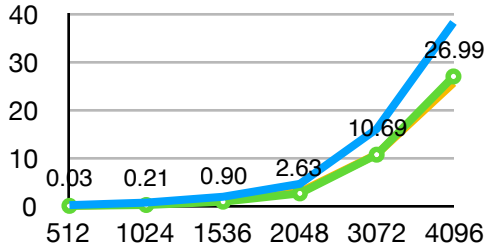
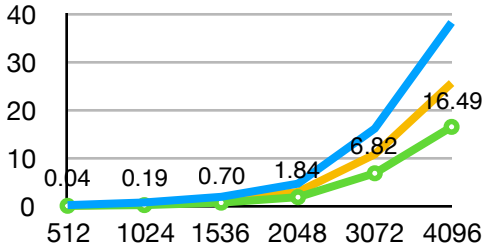
Task 2 Writeup

After running through many different tests, our results showed that a block size of 128 was ideal for computing the block cholesky factorization. We were able to generate a speed up of $\frac{12.624}{11.401} = 1.107$ for a matrix size of 4096 x 4096. Also a block size of 16 had the worst results of the block sizes tested, and as the block size increased the cholesky factorization became faster and faster. This can be attributed to the size of the cache line, meaning as the block size got larger it filled the cache line enough to minimize the amount of cache misses. The program would then need to go into memory and retrieve data, which is an expensive operation.The size of the matrix only started to affect the results once it started to get large, at around 3072 x 3072, and the time from 2048 to 3072 almost tripled. Below are the results of each block size, where each graph represents a specific block size and the lines represent the timings for initialization, cholesky factorization, and validation for matrices sizing from roughly 512 to 4096. The blue = initialization, green = cholesky factorization, orange = validation and the x-axis represents the matrix size (N x N) and the y-axis represents time (s). The data points represent cholesky factorization timings for each matrix size for easy comparison.

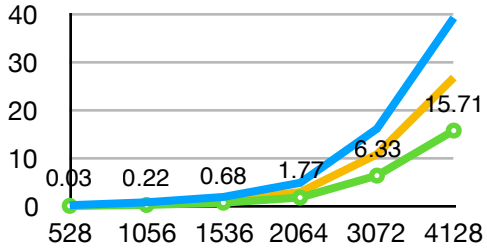
Cholesky Blocksize: 16



Cholesky Blocksize: 32

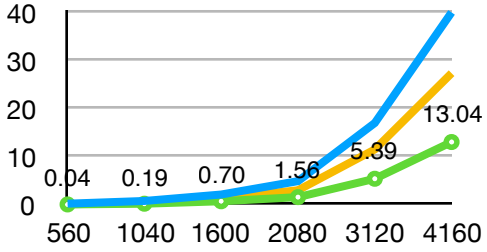


Cholesky Blocksize: 48



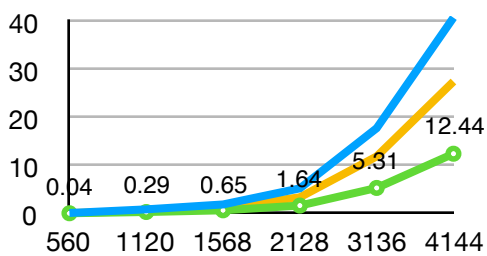
Cholesky Blocksize: 64

Cholesky Blocksize: 80

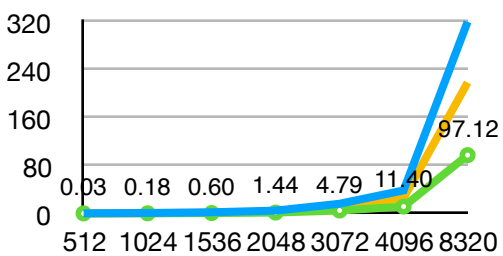


Cholesky Blocksize: 96

Cholesky Blocksize: 112



Cholesky Blocksize: 128



Serial Cholesky Blocksize: 1