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COMP30250_assignment_2

Following are the output of the program straightforward non-blocked:

Benchmark of straightforward non-blocked matrix ijk algorithm   2   * 2   -   0.000001
Benchmark of straightforward non-blocked matrix ijk algorithm   4   * 4   -   0.000001
Benchmark of straightforward non-blocked matrix ijk algorithm   8   * 8   -   0.000005
Benchmark of straightforward non-blocked matrix ijk algorithm   16   * 16   -   0.000040
Benchmark of straightforward non-blocked matrix ijk algorithm   32   * 32   -   0.000284
Benchmark of straightforward non-blocked matrix ijk algorithm   64   * 64   -   0.002245
Benchmark of straightforward non-blocked   matrix ijk algorithm 128   * 128 -   0.017626
Benchmark of straightforward non-blocked matrix ijk algorithm   256   * 256 -   0.237412
Benchmark of straightforward non-blocked   matrix ijk algorithm 512   * 512 -   6.731306
Benchmark of straightforward non-blocked matrix ijk algorithm   1024 * 1024 -   56.218484

Which the graph is below

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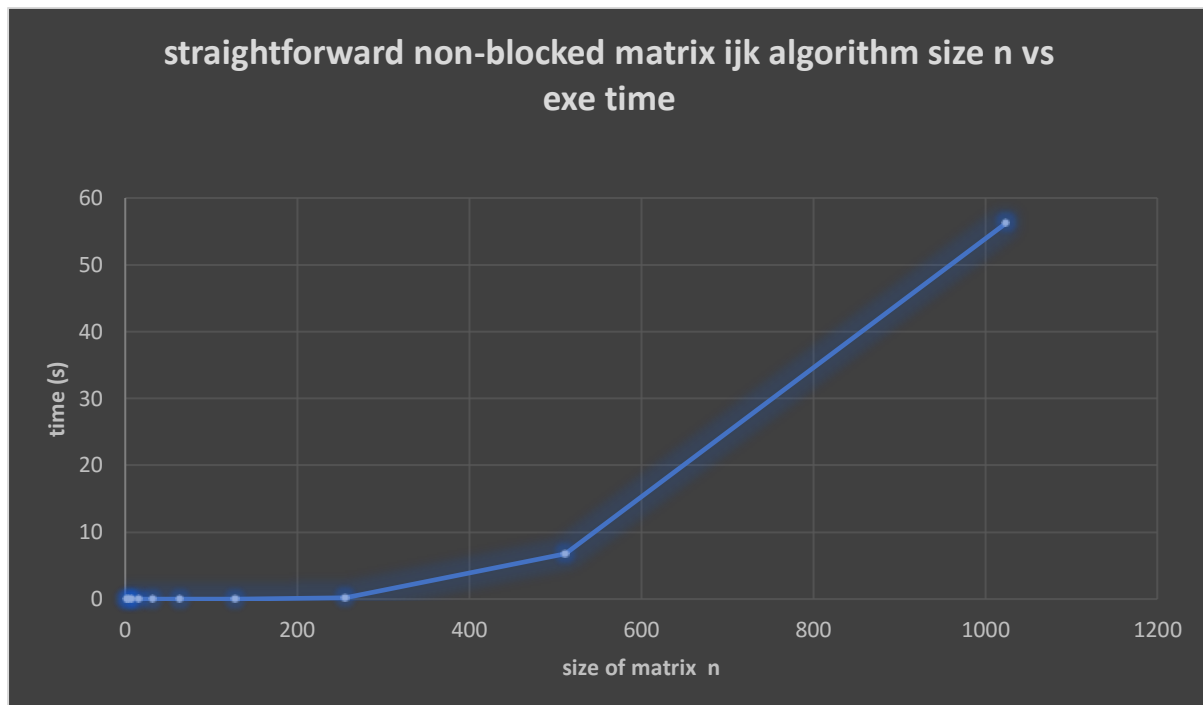
Following are the output of the program BLAS Blocked ijk algorithm:

Benchmark of BLAS Blocked 2 * 2 matrix ijk algorithm using block size   2   - 0.000032
Benchmark of BLAS Blocked 4 * 4 matrix ijk algorithm using block size   2   - 0.000004
Benchmark of BLAS Blocked 4 * 4 matrix ijk algorithm using block size   4   - 0.000001
Benchmark of BLAS Blocked 8 * 8 matrix ijk algorithm using block size   2   - 0.000014
Benchmark of BLAS Blocked 8 * 8 matrix ijk algorithm using block size   4   - 0.000004
Benchmark of BLAS Blocked 16 * 16 matrix ijk algorithm using block size   2   -0.000107
Benchmark of BLAS Blocked 16 * 16 matrix ijk algorithm using block size   4   - 0.000022
Benchmark of BLAS Blocked 16 * 16 matrix ijk algorithm using block size   16   - 0.000010
Benchmark of BLAS Blocked 32 * 32 matrix ijk algorithm using block size   2   - 0.000844
Benchmark of BLAS Blocked 32 * 32 matrix ijk algorithm using block size   4   - 0.000176
Benchmark of BLAS Blocked 32 * 32 matrix ijk algorithm using block size   16   - 0.000044
Benchmark of BLAS Blocked 64 * 64 matrix ijk algorithm using block size   2   - 0.006869
Benchmark of BLAS Blocked 64 * 64 matrix ijk algorithm using block size   4   - 0.001375
Benchmark of BLAS Blocked 64 * 64 matrix ijk algorithm using block size   16   - 0.000352
Benchmark of BLAS Blocked 128 * 128 matrix ijk algorithm using block size 2   - 0.053492
Benchmark of BLAS Blocked 128 * 128 matrix ijk algorithm using block size 4   - 0.011179
Benchmark of BLAS Blocked 128 * 128 matrix ijk algorithm using block size 16   - 0.003384
Benchmark of BLAS Blocked 256 * 256 matrix ijk algorithm using block size 2   - 0.531260
Benchmark of BLAS Blocked 256 * 256 matrix ijk algorithm using block size 4   - 0.111572
Benchmark of BLAS Blocked 256 * 256 matrix ijk algorithm using block size 16   - 0.032162
Benchmark of BLAS Blocked 256 * 256 matrix ijk algorithm using block size 256   - 0.010332
Benchmark of BLAS Blocked 512 * 512 matrix ijk algorithm using block size 2   - 5.940157
Benchmark of BLAS Blocked 512 * 512 matrix ijk algorithm using block size 4   - 1.258789
Benchmark of BLAS Blocked 512 * 512 matrix ijk algorithm using block size 16   - 0.306695
Benchmark of BLAS Blocked 512 * 512 matrix ijk algorithm using block size 256   - 0.076997
Benchmark of BLAS Blocked 1024 * 1024 matrix ijk algorithm using block size 2   - 47.106225
Benchmark of BLAS Blocked 1024 * 1024 matrix ijk algorithm using block size 4   - 10.030258
Benchmark of BLAS Blocked 1024 * 1024 matrix ijk algorithm using block size 16   - 2.457905
Benchmark of BLAS Blocked 1024 * 1024 matrix ijk algorithm using block size 256 - 0.614176

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Following are the output of the program BLAS Blocked kij algorithm:

Benchmark of BLAS Blocked kij 2 * 2 matrix algorithm using block size 2 - 0.000027
Benchmark of BLAS Blocked kij 4 * 4 matrix algorithm using block size 2 - 0.000004
Benchmark of BLAS Blocked kij 4 * 4 matrix algorithm using block size 4 - 0.000001
Benchmark of BLAS Blocked kij 8 * 8 matrix algorithm using block size 2 - 0.000015
Benchmark of BLAS Blocked kij 8 * 8 matrix algorithm using block size 4 - 0.000004
Benchmark of BLAS Blocked kij 16 * 16 matrix algorithm using block size 2 - 0.000104
Benchmark of BLAS Blocked kij 16 * 16 matrix algorithm using block size 4 - 0.000023
Benchmark of BLAS Blocked kij 16 * 16 matrix algorithm using block size 16 - 0.000009
Benchmark of BLAS Blocked kij 32 * 32 matrix algorithm using block size 2 - 0.000824
Benchmark of BLAS Blocked kij 32 * 32 matrix algorithm using block size 4 - 0.000173
Benchmark of BLAS Blocked kij 32 * 32 matrix algorithm using block size 16 - 0.000044
Benchmark of BLAS Blocked kij 64 * 64 matrix algorithm using block size 2 - 0.006564
Benchmark of BLAS Blocked kij 64 * 64 matrix algorithm using block size 4 - 0.001418
Benchmark of BLAS Blocked kij 64 * 64 matrix algorithm using block size 16 - 0.000348
Benchmark of BLAS Blocked kij 128 * 128 matrix algorithm using block size 2 - 0.052639
Benchmark of BLAS Blocked kij 128 * 128 matrix algorithm using block size 4 - 0.010919
Benchmark of BLAS Blocked kij 128 * 128 matrix algorithm using block size 16 - 0.003402
Benchmark of BLAS Blocked kij 256 * 256 matrix algorithm using block size 2 - 0.428216
Benchmark of BLAS Blocked kij 256 * 256 matrix algorithm using block size 4 - 0.092380
Benchmark of BLAS Blocked kij 256 * 256 matrix algorithm using block size 16 - 0.030762
Benchmark of BLAS Blocked kij 256 * 256 matrix algorithm using block size 256 - 0.010255
Benchmark of BLAS Blocked kij 512 * 512 matrix algorithm using block size 2 - 3.417072
Benchmark of BLAS Blocked kij 512 * 512 matrix algorithm using block size 4 - 0.743071
Benchmark of BLAS Blocked kij 512 * 512 matrix algorithm using block size 16 - 0.256775
Benchmark of BLAS Blocked kij 512 * 512 matrix algorithm using block size 256 - 0.077774

BLAS Blocked size b to execution time jik

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BLAS Blocked size b to execution time ijk
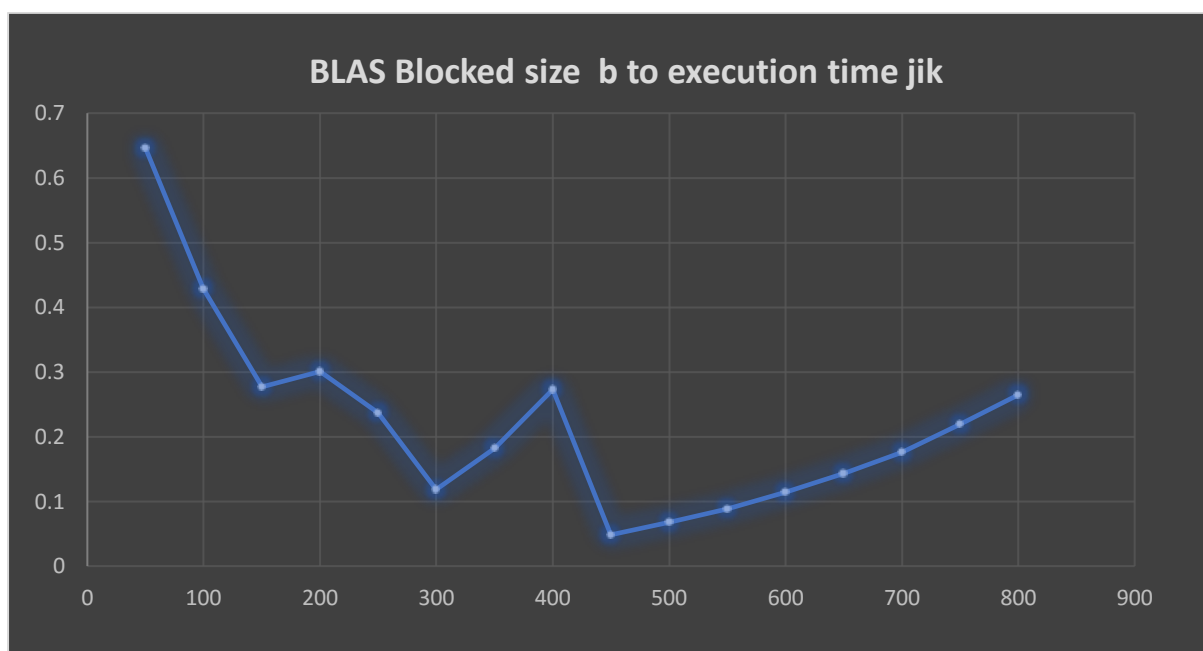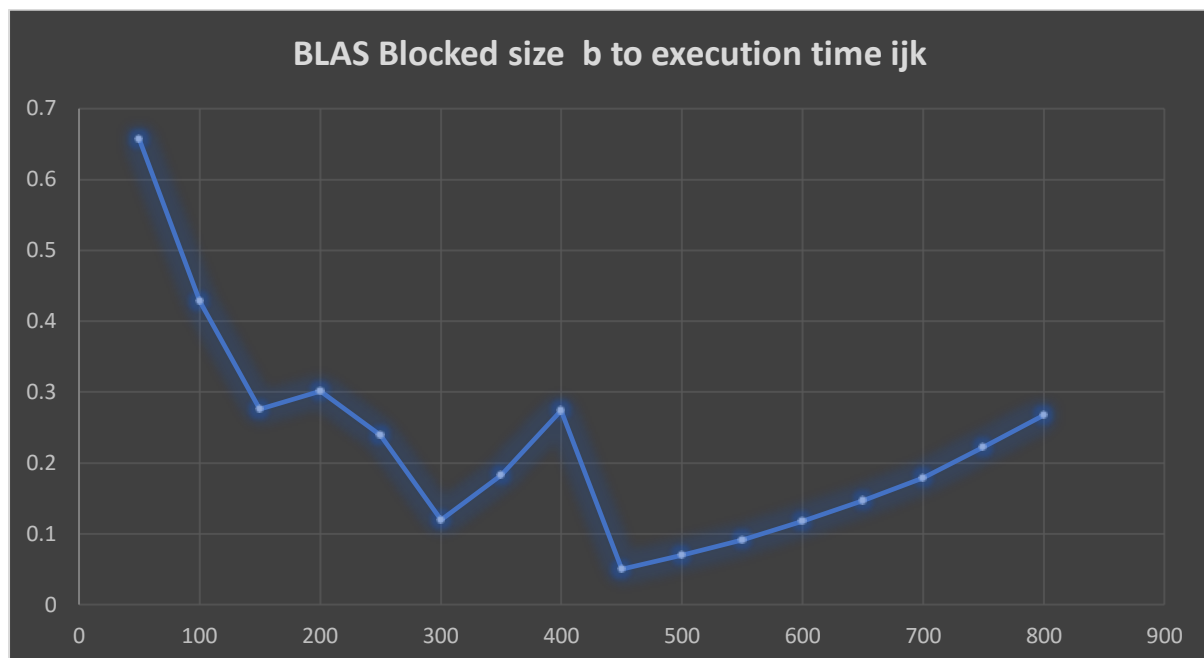
1) As we observe from the graph and output of the program. no matter what is the size of the matrix n is. The fastest blocked algorithm has a block size of approx. 0.6*n. Which yields the fastest operation time. And under the blas algorithm there's almost no difference between ijk and kij algorithm. But blas call are much faster than the straightforward non-blocked algorithm.

2) the fastest is BLAS using dgemm with block size of approx. 0.6*n with execution time only around0.0014s. which the straightforward non-blocked algorithm took almost 7s.

3) as we can see :
Benchmark of BLAS nonBlocked ijk algorithm - 0.263912
Benchmark of BLAS nonBlocked kij algorithm - 0.263779

Above are the execution tome of nonBlocked ijk and kij algorithm, below is the execution time of blocked ijk and kij using dgemm in BLAS.

Benchmark of BLAS Blocked ijk algorithm using block size 450 - 0.049956
Benchmark of BLAS Blocked kij algorithm using block size 450 - 0.048376

We can see there's sufficient improvement on execution time while using blocked rather than using the nonblack algorithm.

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