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

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

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

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.