

## ASSIGNMENT 4

Write a parallel *OpenMP* program computing the norm of the product of two  $n \times n$  dense matrices on a  $p$ -processor SMP so that

- $p$  threads are involved in the computations.
- The 1-dimensional parallel algorithm of matrix multiplication is employed:
  - one of matrices is partitioned in one dimension into  $p$  equal slices
  - there is one-to-one mapping between the partitions and threads
  - each thread is responsible for computation of the corresponding slice of the resulting matrix
- Computation of the norm of the resulting matrix employs the *mutex* synchronization mechanism.

You can use BLAS or ATLAS for local computations.

Experiment with the program and build:

- 1) The dependence of the execution time of the program on the matrix size  $n$ .
- 2) The speedup over a serial counterpart of the program.

Explain the results.

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Variants of the assignment:

- 1) Granularity of the program
    - a. Two successive steps:
      - i. Parallel matrix multiplication
      - ii. Parallel computation of the norm of the resulting matrix
    - b. One-step algorithm. No intermediate resulting matrix.
  - 2) Partitioning scheme
    - a. Left matrix is horizontally partitioned
    - b. Right matrix is vertically partitioned
  - 3) Matrix norm to be computed:
    - a. The *maximum absolute column sum norm* (aka *one-norm*)
    - b. The *maximum absolute row sum norm* (aka *infinity-norm*).
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